SECOND SUPPLEMENTAL APPROPRIATION BILL, 1957

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HEARINGS

BEFORE

SUBCOMMITTEES OF THE
COMMITTEE ON APPROPRIATIONS
HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

PART 1

ATOMIC ENERGY COMMISSION—BUDGET PROGRAM
DEPARTMENT OF THE INTERIOR

Printed for the use of the Committee on Appropriations

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DEPARTMENT OF THE INTERIOR

Printed for the use of the Committee on Appropriations

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ATOMIC ENERGY COMMISSION

WEDNESDAY, JUNE 13, 1956.

GENERAL STATEMENTS

WITNESSES

LEWIS L. STRAUSS, CHAIRMAN
THOMAS E. MURRAY, COMMISSIONER
WILLARD F. LIBBY, COMMISSIONER
HAROLD S. VANCE, COMMISSIONER
K. E. FIELDS, GENERAL MANAGER
WILLIAM MITCHELL, GENERAL COUNSEL
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E. J. BLOCH, DIRECTOR, DIVISION OF PRODUCTION
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W. K. DAVIS, DIRECTOR, DIVISION OF REACTOR DEVELOPMENT
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F. J. McCARTHY, Jr., ASSISTANT CONTROLLER FOR BUDGETS
J. A. MILLER, DEPUTY ASSISTANT CONTROLLER FOR BUDGETS

Mr. CANNON. We have with us this morning the representatives of the Atomic Energy Commission with Chairman Strauss.

COMMITTEE PROCEDURE

I would like to say, Mr. Strauss, that we are very anxious to include in the record as much information as possible. We want all the information you can give us, but we hope that not too much of it will be classified and that most of it can be included in the record because there is great interest in this subject. I think in some respects there is a great misapprehension, a misconception about the subject with which you deal, and we would like to make this hearing as complete and as informative as possible. Of course, where any information would prejudice national defense, we expect you to eliminate it from the record. But unless there is some real reason for taking it out, we would be glad if you would leave in the record as much information on the subject as possible. We will be glad to have a statement from you, Mr. Strauss.

Mr. STRAUSS. Thank you, Mr. Chairman.

We will be alert to the point which you have mentioned. We have prepared two statements, one which I would like to deliver to you orally, and which does contain a great deal of informative matter to which your committee is entitled, but which would be informative also to a possible enemy. That we would like to carefully edit. We have prepared, therefore, an edited version of the same statement which will be supplied to the reporter. It might well be, if it would suit you and your committee, that we could testify with absolute freedom and lack of restraint, and then review the record from the point of view of seeing whether anything should be eliminated from it in the interest of national defense. I think it would avoid the frequent going off the record for the purpose of giving a piece of classified or restricted information.

Mr. CANNON. I think that would be highly desirable, Mr. Strauss. We will proceed with the hearing, and you give us such information as you think will be pertinent.

Mr. STRAUSS. Thank you, sir. I might say that procedure has been followed successfully by other committees before which we have testified. We review the testimony very promptly.

First, I think the record should show our appreciation for the opportunity to report to you. We look forward to these annual reviews as the occasion to discuss with you both where we are and where we are going, in order that you may understand the need for the funds requested.

First, I believe it would be appropriate to introduce Commissioner Vance on my right, who appears before the committee for the first time since his appointment to the Commission.

I also would like to introduce General Starbird, the gentleman who has just arisen, who is the Director of Military Application. General Starbird, after a distinguished military career, is heading the Division formerly headed by General Fields, now our General Manager.

Mr. CANNON. We are very glad to have them with us this morning. I wonder if at this time Commissioner Vance could give us a statement as to his general background, so that we will be a little better acquainted with him.

BACKGROUND OF COMMISSIONER VANCE

Mr. VANCE. Mr. Chairman, I am a retired businessman. I am not a scientist, but before retirement I spent some forty-odd years principally in production and engineering lines. My most recent connection was with the Studebaker Corp., in the automobile business. I was president of that company for many years.

I have done some Government work before, going back to the original defense effort in 1940, preceding World War II when I was in Washington with General Knudsen. My first responsibility at that time was machine tools and heavy ordnance. I hope that as time goes on that I may be of some value to the Commission from the standpoint of what experience I have gained in the past, because, after all, the Commission is in the production business as well as in the research business.

Mr. CANNON. You may proceed, Mr. Strauss.

Mr. STRAUSS. Thank you, Mr. Chairman.

GENERAL STATEMENT

The financial requirements of the atomic energy program are provided under two appropriations, one for operating expenses and one for plant acquisition and construction. The total amounts requested for 1957 for each appropriation, including the amendments most recently transmitted to the Congress by the President, are $1,740,400,000 for operating expenses and $158,300,000 for plant acquisition and construction, or a total of $1,898,700,000.

Mr. BOLAND. I wonder if we could inquire whether Mr. Strauss has other copies of his statement for the other members of the committee.

Mr. STRAUSS. We have the unclassified version, Mr. Chairman. The reason I do not have additional copies of this secret document s that we have attempted to keep the number of secret documents io the minimum.

These figures are in the unclassified version, and those will be distributed.

Mr. CANNON. The committee thoroughly approves your restriction on classified information. If you have other material we shall be glad to have copies.

Mr. STRAUSS. There is a great deal of information in this document which you will see should not be in a publicly distributed document.

Mr. CANNON. Certainly.

Mr. STRAUSS. Thank you, sir.

It is our plan to take up the details of our fund requirements after the conclusion of this statement.

PLANT CONSTRUCTION

Let me first refer to our construction program. In 1952 the Congress authorized the last of a series of expansions in our nuclear materials production capacity. For 3 years, beginning in 1952, our construction expenditures exceeded $1 billion dollars annually. Such new plants have been built as Savannah River in South Carolina, Portsmouth and Fernald in Ohio, Paducah in Kentucky, and Rocky

Flats in Colorado. Other plants have been expanded. As new capacity has been completed and placed in operation, our construction has tapered off. In 1955 expenditures for plants dropped to $819 million and in 1956 they are expected to be about $280 million. Little increase is expected in 1957, when expenditures for plants are estimated at $313 million. Barring unforeseen military requirements, we do not anticipate any substantial increase in our requirements for plant construction in future years. I would have to emphasize barring unforeseen military requirements.

OPERATING COSTS

As plant capacity has been built and placed in production, of course our operating costs have grown. For 1956 our net accrued operating costs are estimated at $1,403 million, and in 1957 we estimate a further growth to $1,731 million, as more of these plants come on stream. While the growth in these operating costs from 1952 to 1957 will be about three times, the growth in plutonium and uranium 235 production will be larger. Both operating costs and production will continue to grow in the years ahead as larger quantities of uranium raw materials are obtained. We can also anticipate continued expansion in other portions of the atomic energy program, and particularly in the developmental programs related to propulsion reactors for military use.

I think the very large proportionate increase in production compared to the increase in the capital layout is a noteworthy fact.

Before turning to a review of individual programs, some general observations may serve to keep the several parts of our work in perspective.

The past year has witnessed a tremendous growth in the atoms-for-peace activities of our Government. Strides have been taken toward developing economic nuclear power and expanding other peaceful uses of atomic energy. In accordance with the terms of the Atomic Energy Act, some of the information developed is being exchanged with friendly nations. Despite the growing momentum of these activities concerned with civilian use, the fact still remains that the size of our budget is largely determined by military requirements, and that, Mr. Chairman, bears upon the question you asked me before we began the meeting.

Mr. CANNON. We will take that up at the conclusion of your statement.

Mr. STRAUSS. In 1957, for example, we estimate that 76 percent of our operating costs will be incurred in procuring and producing weapon materials and in designing and producing weapons. In addition, a major part of our reactor development work is concerned with nuclear propulsion for naval vessels and military aircraft. Including this work, more than 86 percent of our 1957 operating costs relate directly to military requirements.

PRODUCTION OF ATOMIC WEAPONS

We want to make it unmistakably clear that the new emphasis on peaceful uses of atomic energy does not imply any diminution in our efforts on military uses. On the contrary, our budget calls for in-

creased effort in 1957 on both the development of military reactors and on the manufacture of weapons.

In our stockpile today we have atomic weapons ranging in size from relatively small artillery shells to large bombs. Similarly, the energy yield of certain weapons is equivalent to a few thousand tons of TNT only, while the yields of other weapons are expressed in terms of megatons—that is, millions of tons of TNT. Our stockpile includes weapons for a great variety of military uses, which our Armed Forces have developed.

Looking ahead, there will be many different designs of weapons, each for a particular task, air to ground, ground to air, and air to air. To be ready when and where they are needed, nuclear weapons must be produced in quantity for each specific use.

In weapons development attention centers on our test program known as Operation Redwing, which is now in progress at the Eniwetok Proving Ground in the Marshall Islands. Such test operations are necessary to assure that our designs are the most efficient and effective we can conceive and that they will operate. New theories and new designs must be tested to prove their performance before production can prudently be undertaken. As applied to television, automobiles, and aircraft, this product testing is standard practice, and is no less necessary for nuclear weapons.

In the absence of a satisfactory disarmament system, a superior weapons capability in the hands of a nation dedicated to peace provides the maximum assurance that a breach of the peace will not be experienced. To assure this superiority, constant efforts must be made to produce the desired results in terms of the weight of weapons, the space they will occupy, the hazards to operating personnel which they present, and of course to diminish their unit cost as far as possible.

Some notion of the versatility of the atomic arsenal which the United States has developed may be seen from the chart which we have prepared, showing the weapons which will be either in stockpile or in some stage of production during the fiscal year 1957.

On the left are the free-fall weapons, the weapons that are dropped from planes. The numbers to the left are their designations, their military marks. There is also an indication of their general appearance.

The thermonuclear on the right are the so-called H-bombs, and the fission weapons on the left are the so-called atomic bombs or A-bombs.

Mr. CANNON. Will you, Mr. Strauss, at this time differentiate between the fission and the thermonuclear?

Mr. STRAUSS. I think it can be done for the record by saying this, Mr. Chairman: The atomic weapon is the weapon which derives its explosive force from the fission of the atoms of uranium 235 or plutonium, and the thermonuclear weapon is the weapon which derives its explosive power from the fusion or bringing together of the nuclei of atoms at the other end of the atomic scale, that is to say, the light elements such as deuterium, which is an isotope of hydrogen. The rate of explosion, the force, is very much greater for the thermonuclear weapon that it is for the fission weapon.

DEFINITION OF ISOTOPES

Mr. JENSEN. Will you define the word "isotope"?

Mr. STRAUSS. I would not hesitate to define it except in the presence of Dr. Libby. I therefore would ask if he would define it.

Mr. LIBBY. Mr. Jensen, there are about a thousand different kinds of atoms in nature, and they are divided into 92 different classes. Now, each class of atom is called an element. Hydrogen, sodium, and oxygen are classes of atoms. Now, the members of these different classes are called isotopes. They are atoms which are chemically the same but nuclearly different, that is, their nuclei are different. The reasons why they are chemically the same is that the chemical properties, the question of whether it is oxygen or hydrogen, is settled by the outside part of the atom, and not by the tiny particle in the middle, which is the nucleus.

If you had an atom the size of this room, the nucleus would be the size of a very small beebee shot in the middle. That is the nucleus. But the ordinary chemical properties, the ordinary properties of matter make up the vast bulk of the volume. So atoms which have the same outside are isotopes. They may have entirely different insides.

Mr. PHILLIPS. May I ask a question along that same line?

Why do you then speak of furnishing isotopes for use in medicine or experiments when as a matter of fact that is not exactly what you are supplying, is it?

Mr. LIBBY. These isotopes have special properties. For example, there are 2 kinds of carbon—2 isotopes—carbon 12 and carbon 13. But there is another isotope which you can make in a chain reacting pile, carbon 14, which is radioactive. So if you grow a sugar beet with this kind of carbon dioxide, the sugar you get from the sugar beet will make a geiger counter click. This property permits you to study the metabolism of sugar in the human body by using that kind of sugar in a way which is impossible with ordinary sugar. That is why it is so valuable.

Mr. PHILLIPS. I understand that, but is the use of the word "isotope" correct in talking about what you furnish?

Mr. LIBBY. We should talk about radioactive isotopes, isotopes which have a special detectability. That is what we should say.

Mr. CANNON. You may proceed, Mr. Commissioner.

Mr. STRAUSS. Mr. Chairman, I went to the chart to satisfy myself as to the nature of the practically indistinguishable small figures before the bomb diagrams. They are the dimensions, diameters, and lengths of the weapons. Unless some of the committee members are specifically interested in those, I shall not mention them. They are there for you to see. That is the type of classified information that I assume has no particular value for your deliberations.

Mr. PHILLIPS. In the chart, does the size of the falling missile, the gravity missile on the right and left of the arrow, does that indicate the actual physical size or its explosive relationship?

Mr. STRAUSS. No, sir; they are not drawn to exact scale. They are only roughly drawn to scale.

PRODUCTION OF SPECIAL NUCLEAR MATERIALS

Mr. STRAUSS. Now, I come to the part of the report which deals with source and special nuclear materials. Very large quantities of weapon materials must be produced over the next several years in order to produce the various weapon types now planned. The principal materials needed are uranium 235 and plutonium. Except for minor additions we now have the plants to do this job. They represent an investment of $4.8 billion, or 74 percent of our total plant investment of $6.5 billion as of last June 30. In fact, 1957 will be the first complete year in which all of our production reactors, all of our chemical separation plants, and all gaseous diffusion plants will be in operation.

An important feature of the Commission's production plants is that they afford a great deal of flexibility to meet varied product requirements. Generally speaking, the unit costs for producing each of the key materials will be less in 1957 than for earlier years. The increase over 1956 in the total costs of the special nuclear materials program will bring a larger gain in the production of uranium 235 and plutonium. In the years after 1957 we expect additional production gains. One reason for this is continued improvement in production technology. In considering how much farther technical progress can go, we should remember that the atomic energy industry is less than 15 years old. Many improvements on which we are now at work show great promise, and we can look forward with confidence to both increasing the production of our plants and reducing still further the unit cost of our products.

Research and development, of course, play a leading role in solving problems in our plants or improving their performance. For example, developments in metallurgy, fuel elements, heat removal, and general operational understanding have led to higher productivity in the reactors. At Savannah River, which is newer, reactor production is exceeding the original design capacity, and the prospects are for further increase. In the gaseous diffusion plant, studies on compressor, barrier, and converter designs have led to major improvement programs. Over the next few years this program should increase the production capacity for uranium 235.

SUPPLY OF RAW MATERIALS

To achieve the greater production of weapon materials after 1957 larger quantities of uranium will be needed as raw material.

For many years, it appeared that the prospective supply of uranium might serve to limit and define the shape of our military efforts but successive discoveries of major ore bodies during the past 3 years, primarily in the United States and Canada, have substantially changed this picture and today we can plan with confidence for a rapidly expanded use of uranium for civilian applications while still giving priority to military requirements.

We take great satisfaction from the growth in North American production which is making us less dependent on overseas sources of uranium. These overseas sources will nevertheless continue to make a valuable contribution to our strength. To assure continuing supplies and to provide incentive for exploration and mine development, the Commission has entered into long-term commitments. For

example, our Canadian contracts and our domestic schedule of guaranteed ore prices extend to March 31, 1962. For the period beyond March 1962 and extending to the end of calendar year 1966, we have recently announced prices that we will pay for uranium concentrates produced in the United States. This guaranty, however, applies only to the first 500 tons of uranium oxide from any one producer. We all recognize that the uranium we buy constitutes a national asset of enduring value, and that in an expanding economy it is not likely that we could have too much of it.

To process the larger uranium supplies, additional feed material capacity is now under construction at Fernald, Ohio, and St. Louis, Mo. Further capacity will be required to handle the uranium feed material projected for the year 1957. We have therefore invited private industry to submit proposals to build and operate 5,000 tons of additional capacity for the production of refined uranium salts under 1 or more supply contracts. Until we receive the contract proposals next fall, the Commission will be unable to determine whether it is in the best interest of the Government to procure these 5,000 tons from industry or alternatively to build additional Government-owned capacity.

REACTOR DEVELOPMENT PROGRAM

Now we reach the subject of reactor development, Mr. Chairman. We have so far been discussing aspects of the atomic-energy program supporting the development and production of weapons. The Commission's other major development program is concerned with reactors, primarily reactors to produce power. The power reactors we are developing are basically for two applications, the propulsion of naval vessels and military aircraft, and the generation of electricity. While progress has been gratifying, we are still only at the dawn of nuclear power. In nuclear propulsion the first full-scale demonstration has been the submarine *Nautilus*, in operation a little more than a year. In the nuclear generation of electricity, our first full-scale demonstration will come next year at Shippingport, Pa. The real significance of our technical accomplishments to date lies in the potentialities that they reveal for the future.

The development of reactors for specific military applications accounts for more than 60 percent of the funds that we are requesting for reactors, but increased emphasis is also being placed upon reactors for civilian electric power.

The *Nautilus* which I have mentioned has far surpassed the performance of submarines powered with conventional fuel. Our naval program has also included a second type of reactor recently installed in the submarine *Seawolf*, which is now being made ready for trials. Propulsion units are also being developed specifically for other submarine types, for a large surface ship, a frigate, a guided-missile cruiser, and a destroyer. The ultimate objective is a nuclear-powered fleet which would have virtually unlimited cruising range, and would make the Navy independent of overseas oil supplies in time of war.

I might say that the *Nautilus* has cruised in excess of 39,000 miles during this last year and has never been refueled. More than 20,000 of those miles has been totally submerged.

In the work on aircraft reactors, the engineering challenge has been even more formidable. To improve the prospects for early success, a number of independent approaches are being followed in developing a practical design.

In January a turbojet engine was for the first time powered exclusively by heat from an experimental reactor operating on the ground at our testing station in Idaho. More ambitious tests will follow.

The very low fuel requirement of the nuclear reactor makes it technically attractive as a power source for remote military installations. With the Army we are developing a packaged or prefabricated powerplant which can be taken apart and transported for assembly in remote areas. It is known as the Army package power reactor, and the first one is now being constructed right near Washington at Fort Belvoir, and is scheduled for completion by July of next year. It will serve as the basic experiment in the development of reactors for this purpose, reactors which can be disassembled, flown to a location and erected.

CIVILIAN POWER REACTORS

Experience shows that much of the technology being developed for military reactors will also be applicable to reactors for civilian power. While military designs must emphasize such factors as low weight and small size, reactors for civilian power must be designed with the ultimate objective of competing with the generation of power from conventional fossil fuels.

To achieve lower costs for nuclear power, alternative reactor systems are being explored. Each system seeks an optimum combination of such factors as high operating temperatures, simplified fuel fabrication and recovery, long-lived fuel elements, low-cost fuel inventory, low plant investment and ease of operation and maintenance.

I think there should be an additional factor—safety.

Components, and then entire systems must be developed and tested to determine which concepts offer the greatest potential for electric power generation at competitive costs.

To assure our position of world leadership in the peaceful uses of atomic energy, it is essential to our national interest that we pursue economic nuclear power as rapidly as is consistent with sound technical development.

The capacity of the United States to produce special nuclear materials for use in weapons is, as we all know, a potent deterrent to war. This same capacity has permitted the earmarking of sufficient special nuclear material to initiate a program of civilian power reactors, both at home and with friendly nations abroad.

The enactment of the Atomic Energy Act of 1954 gave great impetus to private participation in the peaceful aspects of atomic energy as evidence by what has taken place in the past 12 months. A year ago plans for the construction of the first full-scale power reactor to be built with private capital had been announced by the Consolidated Edison Co. Also, four proposals had been submitted by the utilities industry in response to the Commission's offer to provide certain types of assistance for the development, construction, and operation of demonstration power reactors. That was a year ago.

What is the picture today? First of all, a construction permit has been issued to Consolidated Edison after a careful review of their plans. A construction permit has also been issued to Commonwealth Edison of Chicago for the reactor project originally submitted as a power-demonstration proposal, but now being carried forward on a straight licensing basis without any financial assistance from the Government. Of the other three power-demonstration proposals, a contract was executed recently with the Yankee Atomic Electric Co. and negotiations are nearing conclusion on the other two.

In addition, other utility companies, either formally or informally have announced their intention to construct power reactors without Government financial assistance. Taken together, independent projects and the three proposals for demonstration reactors to be carried out with Government assistance, would represent in the neighborhood of 1 million kilowatts of installed electrical capacity.

Their estimated capital cost would be about $300 million, of which the Commission would be called upon to provide less than $10 million for direct research and development assistance for these projects.

Mr. CANNON. May we have those figures again, Mr. Strauss.

Mr. STRAUSS. The estimated capital cost of the 1 million kilowatts of installed capacity in these plants is expected to be about $300 million, of which the Government would be called upon to provide less than $10 million. The balance is coming from industry.

For direct research and development assistance for these projects, the Commission expects to incur costs itself of about $12 million. This is for research and development which will of course be useful then to all people, cooperatives, industries, and others building powerplants in the future. The tentative dates for initial operation of these power reactors extend from 1959 to 1962. That is to say, these are the dates by which it is expected that they will be completed.

In September last, the Commission invited a second round of power demonstration proposals aimed specifically at stimulating interest in smaller reactors in the range of 5,000 to 40,000 kilowatts. Of the 7 proposals received by February of this year, 2 have been approved in principle as a basis for contract negotiations. The sponsors of both of these are electric cooperatives. One of the reactors would have an electrical capacity of 22,000 kilowatts, the other somewhere between five and ten thousand kilowatts. The combined capital cost of these two projects is nearly $10 million, of which the sponsors would provide somewhat more than one-third for the generating equipment, and the Commission would pay for and own the reactors, with the cooperatives having an option to purchase them at a later date.

The furthest advanced full-scale civilian power reactor is, of course, the pressurized water reactor which I previously mentioned, being constructed with Government and private funds at Shippingport, Pa., and scheduled to begin operation next summer.

In addition, the Commission's experimental program includes a number of projects aimed at construction and operation of smaller pilot scale models of varied sizes and types, by which we hope to explore the technical problems and the basic feasibilities of the most promising design concepts. By placing the results of this work at the disposal of industry, we make it possible for private enterprise to

assume the principal responsibility for building larger prototypes and full-scale commercial plants. We believe that this is the most desirable way to achieve competitive nuclear power, and furthermore it carries out the precept in the act, whereby Congress enjoined us to "strengthen free competition in private enterprise."

Industry response to date has been most encouraging. We hope that private enterprise will continue to do this part of the job with drive and enthusiasm, with the Government concentrating on the pioneering research and development, to the end that overall progress in the achievement of economic nuclear power will proceed at the rapid rate required by our national interest.

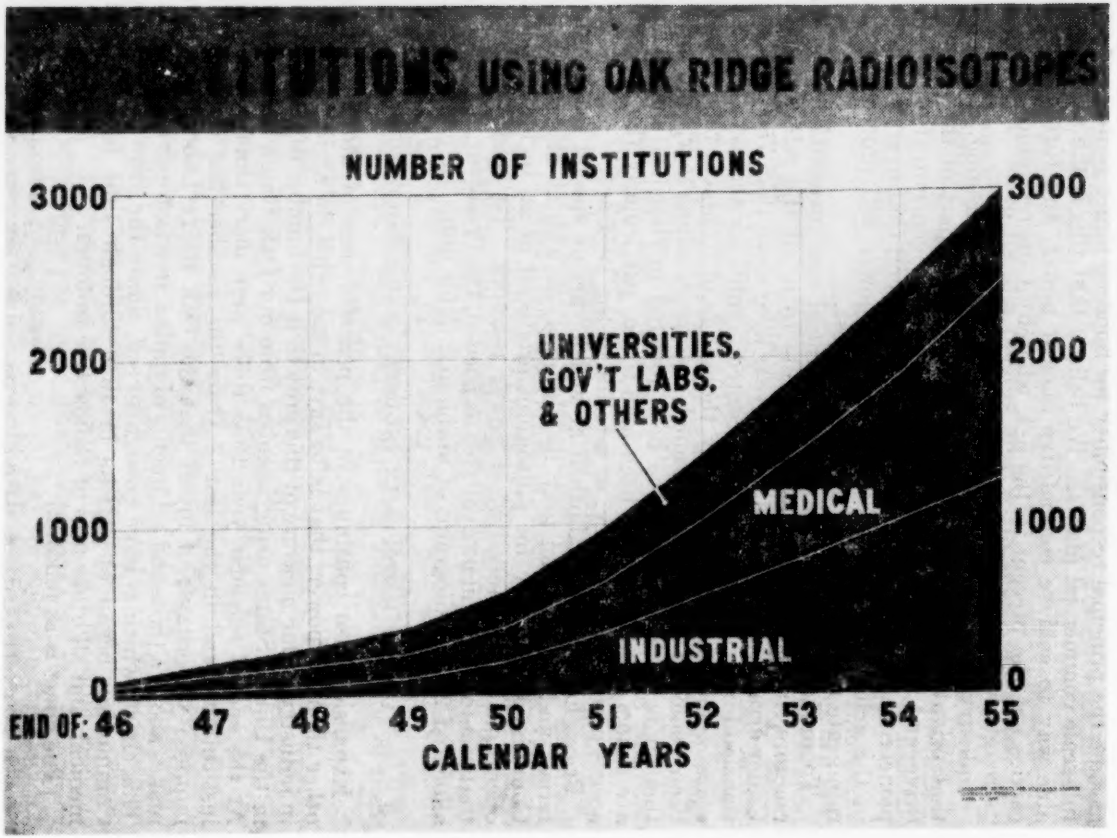
To make long-range plans and financial commitments for power reactors, industry must have available to it all the relevant data. Under arrangements established a year ago, more than 750 organizations and individuals have been granted permits for access to classified nonweapon information. Many thousands of technical reports have been removed from the classified categories altogether, and other thousands of documents have been lowered in classification. These are things which we have been able to do, particularly the giving of access permits to industry, as a result of the 1954 act.

Prices have been established at which various special reactor materials and reactor fuel may be obtained, as well as the prices the Commission will pay for plutonium produced as an incident to the operation of privately owned power reactors. To assure industry that reactor feed will be available as needed, the President in February allocated 20,000 kilograms of uranium 235 for domestic civilian uses.

USE OF ISOTOPES IN INDUSTRY AND AGRICULTURE

Expansion also continues in the peaceful uses of atomic energy other than for power, that is to say, in medicine, in agriculture, and in industry. One measure of this growth is the number of institutions in the United States using isotopes from our Oak Ridge Laboratory. At the end of calendar year 1955 there were more than 3,000 such institutions, and in the last 3 years the number has doubled. I inquired yesterday and found that the Oak Ridge Laboratory now makes about a thousand shipments of radioactive isotopes each month. This chart, which is large enough to see, shows the growth since the Commission began operations in 1946 through 1955 in industrial, medical, and all other uses of radioactive isotopes.

(The chart is as follows:)


NUMBER OF INSTITUTIONS
3000
2000
1000
0
UNIVERSITIES, GOV'T LABS, & OTHERS
MEDICAL
INDUSTRIAL
END OF: 46 47 48 49 50 51 52 53 54 55
CALENDAR YEARS

INTERNATIONAL COOPERATION

The peaceful uses of atomic energy are becoming a reality for the people of many nations, under the atoms-for-peace policy which the President announced in his United Nations speech in December 1953. The international atomic energy conference at Geneva last summer produced an unprecedented exchange of information on the constructive uses of the atomic energy. I think you gentlemen know that that conference originated with the Commission. It was taken up by the Government and by other governments, and it was generally agreed by those who attended, including a large delegation from the House and the Senate, that it was an extraordinarily successful affair.

During the past year we have negotiated bilateral agreements, also authorized by the act of 1954, providing for cooperation with 30 nations, and additional agreements are still being negotiated. Under these agreements we will be providing technical and in some cases financial assistance under the program announced by the President last June, and reaffirmed by his recent allocation of 20,000 kilograms of uranium 235 for peaceful uses abroad. A number of foreign countries are going ahead with plans to acquire research or power reactors with United States assistance. For example, Brazil has recently announced that it will contract with a United States manufacturer for a research reactor to be located at one of its leading universities.

Last night the German Chancellor, Chancellor Adenauer, told me that their Atomic Energy Commissioner, who bears the same name as I do, and who was here a few weeks ago, is returning next week to place orders for three research reactors with American firms. Three research reactors, each of a different type, have been ordered from three other United States manufacturers by Spain, Italy, and Japan. We hope that the United States has thus already seized and can maintain the lead position in the export of nuclear power equipment.

Most nations need information, training, and technical assistance, as well as reactors and reactor materials. Technical libraries have been presented to more than 40 nations. Foreign technicians are being trained in the United States, and the way has been eased for United States companies to provide unclassified assistance to foreign atomic energy programs in friendly countries.

All the technologies of course are based on the earlier accomplishment of the imaginative scientists or engineers.

Mr. PHILLIPS. Before we get too far beyond that chart, may I ask a question about it? I notice you have your green strip in that chart as medical and the black as industrial, while the orange strip represents universities, government labs, and others. I notice there is no special heading for research in agriculture. I am curious to know whether that is included in the orange strip, and therefore if it is so much less in quantity than that which is being applied to medical research?

Mr. STRAUSS. I would think, sir, that the reason is that most of the agricultural research is being carried on in our own laboratories and in the land grant colleges of the country which have agricultural departments, whereas the medical curve represents not only research, but also includes the large numbers of shipments to hospitals for thera-

peutic purposes. If course, there are very many more of those in number than there are actual research requirements. I believe that is an explanation, Mr. Phillips.

Dr. DUNHAM. That is absolutely correct.

NEED FOR BASIC RESEARCH

Mr. STRAUSS. It has been said that Lord Kelvin was as essential to the age of steam as Albert Einstein was to the age of the atom, but the arresting truth of our own day is that it is more and more difficult for scientific discovery to keep ahead of the demands of technology for new information. This fact gives fundamental research an ever more important, ever more crucial role in our national destiny. I would like to say at this point, Mr. Chairman—and this is not in my statement—that one of the things of which the Commission is proudest is that your committee and the Congress, have not stinted us in the past on our research program, and I believe that large dividends will come from that to our whole Nation in the future. Whatever we do, this is one thing that must not be allowed to suffer.

The accomplishments of the scientist in his laboratory is the key to engineering achievement. Neglect of basic research on the other hand could deprive us of this key to the future, and thereby cost us our world leadership in both peaceful and military aspects of atomic energy. With such issues at stake, we may not postpone scientific inquiry in promising areas opened up by the discovery of new phenomena.

Some of the most fruitful areas of research have to do with the extension of man's control over his environment into new ranges of temperature and energy. This type of problem has been encountered in the development of nuclear propulsion for aircraft where reactor components must be able to withstand extremely high temperatures and very intense radiation for prolonged periods.

Looking further into the future, and to more extreme requirements, the scientists are faced with achieving temperatures of 10 to 100 million degrees centigrade, and doing so to provide a controlled thermonuclear reaction.

HIGH ENERGY ACCELERATORS

Indispensable for research in high energy physics are particle accelerators, such as the Brookhaven Cosmotron and the Berkeley Bevatron, as of now the two most powerful accelerators in the world. An outstanding scientific event was the recent verification in our Bevatron experiments of the predicted existence of another fundamental particle, the antiproton. That was discovered or identified last year. We do not know yet what its significance may be.

We have recently approved the construction of two high energy accelerators as a cooperative effort with two university groups, one of them Harvard-Massachusetts Institute of Technology, the other Princeton-University of Pennsylvania. Higher energies will be possible with the alternating gradient synchrotron now under construction at Brookhaven. We are also giving serious consideration as to how we may most effectively cooperate with private institutions in the development of still more powerful accelerators, and those negotiations are active at the moment.

BIOMEDICAL RESEARCH

In the field of biology and medicine, biomedical research presents to us the most compelling portrait of the benign atom, for here its benefits are measured in terms of saving human lives and helping to heal the sick and to relieve pain and want.

Particularly impressive over the years have been the steady advances made by biomedical research upon the most dreaded of all human afflictions, cancer. Basically, the problem is to discover those features in the life cycle of the cancer cell which distinguish it from normal, healthy cells. Research supported by the Commission has recently indicated by the use of radioisotopes that there may indeed be certain peculiarities in cancer cells which can be used to control their growth.

While radioisotopes are now being used actually to destroy cancerous tissues in hospital patients, greater opportunities for research in cancer therapy will be made available in the new medical research center at Brookhaven where we will have the world's first reactor built exclusively for medical research. Far-reaching benefits may also be derived from the use of radioisotopes in improving or preserving agricultural products. The use of gamma radiation in experiments at Brookhaven has produced better varieties of wheat, oats, rice, and flax, not only better varieties, but resistant to pests, such as rust and fungi. Radiation has also been found to produce sterility in certain crop destroying worms and weevils. These are but a few examples of the host of benefits which we may expect to result from the application of atomic energy in agriculture.

There is no mention in that paragraph of its value in discovering the benefits of various kinds of fertilizers, the appropriate times for them to be used, but I think that is perhaps well known to your committee.

Important work is now being supported in biomedical research on the effects of radiation on plants and animals. These basic studies continue as in past years to be a large part of our biology and medicine program, and eventually will enable us to understand exactly how radiation changes each of the vital life processes. Only then can we learn how to control these effects. An effort is also being made to determine the effect of radiation on cell behavior, particularly on the germ cells of plants and animals. From this research we hope to exploit beneficial or useful effects of radiation and to prevent, minimize or alleviate the detrimental effects on living beings.

I might interpolate there, Mr. Chairman, that the newspapers this morning featured the report of the National Academy of Sciences, which has conducted a study for the last year with the cooperation of the Commission on the effects of radiation on human beings, and their environment. They came to a number of very interesting conclusions, among them that the effects of testing of weapons was of the least importance in radiation experienced by human beings today, that by long odds the greatest amount of radiation experienced is from medical X-rays, and from the normal background radiation, from the soil and from the radioactive elements in our own bodies.

They also stated that they thought that the Commission's standards and statements on the subject had, if anything, erred on the ground of conservatism. I think we were all pleased to read that.

DISPOSAL OF COMMUNITIES

The last session of the Congress enacted the Atomic Energy Community Act of 1955, providing for the termination of Government ownership of the communities of Oak Ridge, Tenn., and Richland, Wash. The transfer of ownership is to be accomplished expeditiously but in a manner not to impede the programs which we carry on under the Atomic Energy Act of 1954. The Housing and Home Finance Agency pursuant to a delegation of responsibility by the President is now preparing to sell the real estate which has been classified for sale by the Commission. Other steps are being taken to reorganize the communities for self-government under the laws of the States in which they are found. A beginning has also been made in the transfer of other facilities. For example, arrangements are now being concluded at Richland for the transfer of the Kadlec Hospital to a private operator chosen by a popular referendum.

With the sale of the residential property, the Commission will of course cease to collect the rental revenue. At the same time the Community Act contemplates that the Commission will continue to make financial contributions for operation of these communities. It should therefore be recognized that appropriations will undoubtedly be required for that purpose.

ADMINISTRATIVE COSTS

A concluding word now about the costs incurred for the administrative activities of the Commission and its staff in directing and controlling the operating work under our several programs. The proposed increase of less than 4 percent in these costs we believe to be modest, considered in the light of the Commission's broadened responsibilities in the areas of civilian applications and international cooperation, both required under the new Atomic Energy Act. Comparing our administrative costs to the total operating costs of the atomic energy program, we find that in 1957 they will represent only 2.3 percent of the total, compared to 2.7 in 1956, and 3.1 percent in 1955, and we are proud of those figures, Mr. Chairman.

Mr. CANNON. Will you give us that again?

Mr. STRAUSS. Our administrative costs, compared to our total operating costs, in 1957 will represent 2.3 percent of the total. That same figure was 2.7 in 1956 and 3.1 in 1955.

I might also call attention to the fact that the Hoover Commission, in its report, as a result of the work of the task force of which Mr. J. Harold Stewart, CPA, of Boston, was Chairman, and comprising a number of eminent gentlemen, none of whom are connected with us, the controller of the Lockheed Aircraft Corp., the chairman of the board of the United States Rubber Corp., the controller of International Harvester Co., and others, commented that our accounting was an outstanding example in performance budgeting. "It has been demonstrated," they said, "that where the will exists, the counterpart of industrial performance is possible and an outstanding example is found in the accounting and budgeting performance of the Atomic Energy Commission."

I have not called this to the attention of the controller before, but I am happy to say it here. The Atomic Energy Commission budget

request for its operating expense appropriation is presented on this basis—the basis they recommend. They commend to the other Government departments and agencies our system.

Of course, we are newer; we are an infant agency compared with other Government agencies, and we were able to start without the impediment of a precedent.

You will recall, Mr. Chairman, that last year funds were authorized and provided for the construction of a new headquarters building for the Washington office. The selection of a site near Germantown, Md., was announced last summer, and a contract has been awarded for the construction and engineering service. The construction contract was awarded May 1 to a low bidder, and the building is to be completed in November 1957.

SHORTAGE OF SCIENTIFIC AND TECHNICAL PERSONNEL

I should not close without comment on the shortage of technical and scientific personnel which we are developing in the United States. Commission work is vitally affected, but we have no simple panacea to offer. The solution of this problem requires concerted action throughout our society, beginning we believe at the secondary school level. We urge greater attention to science and mathematics throughout the Nation's whole educational system.

Dr. Libby has been preaching this and I have been helping him. With respect to our immediate shortage of technical personnel, we have encouraged support for university plans to establish and enlarge training programs in nuclear sciences and engineering. However, there are certain direct actions which the Commission itself can appropriately take. We propose, for example, to use the sum of $3 million to buy laboratory equipment which we would then make available to universities for training their students in nuclear sciences.

We propose to provide university faculty members with special training in nuclear engineering through summer institutes and internship appointments to Commission laboratories in order that they in turn can promptly give such subjects proper emphasis in the normal curriculum. We will continue to offer specialized graduate training in our reactor schools in Oak Ridge and Argonne. We will try to stimulate nuclear science training in still other ways, such as by awarding fellowships and preparing textbooks.

The problem of training scientists and engineers is not unique to atomic energy, and our plans are closely tied into those of the National Science Foundation and other Federal agencies in this regard.

Now, Mr. Chairman, I have covered briefly the major highlights of our program. I am sure that you have questions which we shall do our best to answer. The unclassified version of this has been given to the reporter. The General Manager and the division heads and Commissioner Libby, Commissioner Vance, and I will attempt to answer your questions with respect to the detailed items in our budget estimates, which are before you, sir.

Thank you for permitting me to make this statement.

Mr. CANNON. Mr. Strauss, we have been told that our victory in the last war was due not so much to the fact that we outgeneraled the enemy, that we outfought the enemy, that we outproduced the

enemy, but principally to the fact that we outthought the enemy, and that the war was shortened and victory assured because of our scientific achievements which provided advanced scientific weapons.

UNITED STATES LEADERSHIP IN RESEARCH

Germany had always been considered the first scientific nation in the world. They had by general consent been given first place in scientific progress and leadership. But we outdistanced them in scientific progress and the development of scientific weapons won the war.

Just how accurate is that, Mr. Strauss?

Mr. STRAUSS. Mr. Chairman, I think that like all generalizations, it will not stand up. We won the war by a combination of all of the things that you have mentioned. We did have superior science. Among other reasons we had it because German scientists in numbers—scientists from the Axis powers in numbers—immigrated to the United States to escape persecution. It is for that reason that Einstein, Fermi, and others too numerous to mention, came to this country.

On the other hand, it would have been sterile science without the large productive capacity of the United States, without the fighting spirit of the men who used these tools and instruments, without the financial strength of the United States, which was a part of its industrial complex to make and support this war engine. Probably no one of these things could have conquered alone, but the combination is what did it, and not any one of those single attributes.

Mr. CANNON. Would you say, then, that scientific progress was a factor?

Mr. STRAUSS. A great factor. We had radar, we had the proximity fuse, we had at the end the atomic bomb. It will be disputed to the end of time as to whether that actually ended the war or not, whether the war was not over before that happened. But there were many scientific developments that assisted in the end result.

Mr. CANNON. You say our scientific knowledge and laboratory achievements would have been sterile without our productive capacity. Would you say then that without the Tennessee Valley Authority, we would have had difficulty in producing the atomic bomb and starting the activity which is today your special field?

Mr. STRAUSS. I would say in view of the fact that the diffusion plant was located at Oak Ridge, the Tennessee Valley Authority was absolutely essential to it. Had it been located in some other part of the country, it would have gotten its power supply from some other source. But the power supply of the TVA was absolutely essential to the Oak Ridge plant. There is no question about that.

Mr. CANNON. The production of the vast electric power potential was essential to that phase of the work.

Mr. STRAUSS. Yes. The plant at Hanford would not have been operable, nor would it have been located at Hanford except for the power potential on the Columbia River, from Bonneville Dam.

Mr. CANNON. I believe you said in your preliminary remarks that America today enjoyed world leadership in this field.

Mr. STRAUSS. That is my belief, Mr. Chairman.

Mr. CANNON. Would you say that we are secure in maintaining that leadership or is it necessary to continue progress in this field in order to keep ahead of any competition which might menace the peace of the world?

Mr. STRAUSS. I think we must keep ahead in order to avoid that menace and the answer to that lies largely in your hands, and the hands of your committee, as to whether we do.

Mr. CANNON. If you supply the leadership, and we supply the funds, then that is a combination which should be effective.

Mr. STRAUSS. It has been effective to date, sir. I think all of the commissioners who have been appointed on this job by President Truman and President Eisenhower have had a common purpose, and with the assistance of the Congress have been successful in carrying it out to date.

Mr. CANNON. And we are achieving that purpose at the present time?

Mr. STRAUSS. I believe we are, sir.

PROGRESS OF OTHER NATIONS

Mr. CANNON. What would you say of the progress of other nations in this respect? Is there any chance that any of our allies—for example, Britain or France, or others—might take the lead?

Mr. STRAUSS. The answer to that is "yes," because you have said "might". The British have an active atomic-energy enterprise on which they are limited by virtue of the fact that they have a small amount of money compared with ours to dispose of, and a smaller but highly competent scientific community.

Mr. CANNON. You are speaking now of Britain.

Mr. STRAUSS. Yes; I am taking them in turn, sir. In fact, if I am putting too much time on my answer, please cut me off.

Mr. CANNON. This is fundamental, and should be thoroughly explored.

Mr. STRAUSS. I would like to do so, particularly in view of some of the statements that have appeared in the press in recent weeks.

The British enterprise is primarily aimed at producing electrical energy at the earliest possible date, and more or less irrespective of its cost. The reason for that objective is that Great Britain has no oil. Every drop of petroleum burned in her powerplants must be imported. While she was at one time a coal-exporting country, she is today an importer. In 1956 she will import about 19 percent of the coal burned in her electric industry. By 1975, assuming the growth that they anticipate, it has been estimated that she will be importing between 57 and 60 percent of her coal. So Great Britain, in order to prevent an absolute catastrophe if the sealanes were closed to her, must produce electrical energy from the atom, come what may.

Mr. CANNON. You would say then that they are supporting a crash program.

Mr. STRAUSS. Yes, they are. They have a plant called Calder Hall, which they were good enough to show me last year, the first unit of which will come on stream in October of this year. It has already gone critical and will produce in the neighborhood of 60,000 kilowatts of electrical energy. It is not, however, a plant designed

for that purpose. It is a plant designed to produce plutonium, with electricity as a byproduct, and with no particular concern for the cost of that electricity. This course they are able to take for a variety of reasons. Among others is the fact that all electricity produced in England is Government produced, and there is no competition between public and private industry, as I understand it, in the supply of power in England.

Mr. CANNON. The English program is primarily a defense program, a military program?

Mr. STRAUSS. At the moment, yes, but they have on their drawing boards and are to let contracts this year for their first completely civilian power installation in which plutonium is not the primary product, and which they expect will be ready by 1960. They plan to build duplicates of the Calder Hall installation, and they have another type of installation at Dounray, which produces plutonium and from which they will derive power as a byproduct. They expect to have some millions of kilowatts of installed capacity of various types between 1960 and 1965.

In France, there has been for a long time an active program in the atomic-energy field of rather smaller proportions than the British, without the impetus, without the pressure for the production of power, and with a fluctuating attitude toward weapons. That is to say, some administrations are disinterested in weapons. These may be succeeded by an administration which is so interested. The French atomic program is not one from which we anticipate any material competition.

There are atomic-energy programs in Holland, in Denmark, in Norway, in Sweden, in Switzerland, in Italy, and in Spain. In these countries, with the possible exception of Spain, there are very competent men. Dr. Libby will be more familiar with their names than I am, but there are distinguished men in each of these countries.

The Germans have a number of distinguished physicists, Dr. Heisenberg, Dr. Hahn, and others, and they will unquestionably put a great deal of money and effort into their atomic-energy program in an attempt to capture as much as possible of the world's market for reactors and reactor components when they can reach that point. At the moment, because we and the British control the available supplies of uranium in the free world, with small exceptions, we have the edge on the market. As between the British and ourselves, we have a great edge over them because we are able to export fissionable material and they are not.

Now, I have not mentioned the Russian program——

COLLABORATION WITH OTHER NATIONS

Mr. CANNON. Is there any effective collaboration on the part of these allies you have mentioned either among themselves or with the United States, under which you exchange information and scientifically classified material?

Mr. STRAUSS. In answering your question, I will answer it this way, Mr. Chairman. There is cooperation among some of these countries for research purposes. There are three organizations. Two are in existence and one is in contemplation. One of them is called CERN, which is the Council for European Nuclear Research, with headquarters in Switzerland.

Mr. CANNON. Give us that name again.

Mr. STRAUSS. The European Council for Nuclear Research. It takes its name from Le Conseil Européen Pour La Recherche Nucleaire.

Mr. CANNON. All our allies cooperate in that program?

Mr. STRAUSS. No, there are a few. Then there is a group known as the OEEC, the Organization for European Economic Cooperation. This group is also European in character and in composition. It hopes to become a focal point for research and development of the peaceful uses of atomic energy in Europe. The United States is not a member of it. We have an observer who attends its meetings.

Mr. CANNON. How do you account for the fact that we are not included and are not participating?

Mr. STRAUSS. This organization long antedates my familiarity with these facts. It grew out of the United Nations in some way, and while our State Department people are present as observers at its meetings, I am informed that we are not members of it, and do not contribute to its support. It is, as the name implies, an organization limited to Europe.

Mr. CANNON. Would you say that is an advantage or a disadvantage?

Mr. STRAUSS. At the present time, since it is purely a deliberative body which does not own or operate anything, I think it is neither an advantage or disadvantage. It is too early to evaluate. We are observing carefully in order to reach a conclusion.

Then there is an effort sponsored by the Belgians to create an organization which they call EURATOM, which will include Belgium, Luxembourg, France, Italy, the Netherlands, and any of the friendly countries in Western Europe which might join for the purpose of executing an agreement with the Atomic Energy Commission. That organization does not yet exist. Vigorous efforts are being made by the friendly nations that I have mentioned with more or less enthusiasm, depending on which countries are mentioned, to bring it into existence.

Now, in answer to the most important part of your question, what are we doing to collaborate and does it involve classified information? With each of the countries I have mentioned, we have agreements. These are bilateral agreements entered into pursuant to the Atomic Energy Act of 1954, and for the most part, that is to say, with the exception of Canada, the United Kingdom, and Belgium, they provide only for the exchange of unclassified information which would enable them to erect a research reactor and to obtain 6 kilograms of uranium 235, enriched not to exceed 20 percent, that is to say, so that it will not be weapons material.

However, the situation with the Belgians is different. We obtained during the war the bulk of our uranium from the Belgian Congo. We still obtain a respectable percentage from that source. We have arrangements with the Belgians whereby we will help them to build a power reactor. They have contracted for such a power reactor to be built in Belgium. The agreement had originally stipulated a time and place, but that has undergone modification.

With the British we are in a somewhat different position. Prior to the enactment of the Atomic Energy Act of 1946, we had a full partnership with them which also included weapons research. With the enactment of the McMahon Act, that partnership ceased, and it has been only partially resumed.

In January 1948, a so-called modus vivendi was executed between the two Governments as a result of which we exchanged certain information of a classified character without any weapons connotation.

Mr. CANNON. In what way did this act interfere with cooperation?

Mr. STRAUSS. Section 10 (a) and (b) of the act prohibited any citizen of the United States from conveying any information of a military or a commercial nature to any foreign national. It has been so long since I have read that section, Mr. Chairman, that I cannot quote it. I used to be able to quote it. It was the Atomic Energy Act of 1946, the McMahon Act.

Mr. CANNON. It is of a tenor which it did at that time interfere with collaboration?

Mr. STRAUSS. It did. It ended it, and that collaboration was resumed with the consent of Congress in January 1948. In November or December of 1953, with the consent of the Joint Committee, we gave the British information on the effects of nuclear weapons on human beings, and their environment in order to enable them to better protect themselves from the result of an atomic attack if one were made upon them.

Then after the passage of the Atomic Energy Act of 1954, we entered into a negotiation with the United Kingdom which was completed last spring. The agreement was submitted to the President, approved by him, sent to the Congress, and lay before the Joint Committee on Atomic Energy for the statutory required period of 30 days, after which it became effective. We have since negotiated and have submitted to the President an amendment to that bilateral agreement with the United Kingdom which will enable us to exchange information with them on certain aspects of the reactor program applying to military reactors, but which does not involve giving them information concerning how we make atomic weapons or what their geometry and composition is.

Mr. CANNON. Then generally speaking, you can say there is teamwork between the European allies and the United States, both in policies and in technical operation?

Mr. STRAUSS. At the present time, yes, sir.

Mr. CANNON. Is there any competition, for example, in the purchase in the open market of raw materials?

Mr. STRAUSS. Fortunately that does not exist. As a result of continuation into this period of an arrangement that was set up during the war between President Roosevelt, Prime Minister Churchill, and Prime Minister MacKenzie, known as the Combined Development Agency, there is no competition between the British, Canadians, and ourselves, for raw material. Due to the fact that up until now most of the raw material has come from Belgium, South Africa, Canada, Australia, and the United States, that is, the raw material in the free world, no competition has arisen.

There is other production in Portugal and other places, and of course there is production behind the Iron Curtain.

Mr. CANNON. There is no likelihood then that the scarcity of raw material will in any way interfere with our program?

Mr. STRAUSS. We do not believe so.

PERCENTAGE OF MILITARY AND INDUSTRIAL PROGRAMS

Mr. CANNON. You are dealing both with the military program and with the industrial program, but a larger percentage of your activity deals with the military program. To what extent, if any, is there a division among our allies as to military and industrial purposes? What part of the progress which they are making at this time in atomic energy are they devoting to the military program and what part to the commercial program?

Mr. STRAUSS. Mr. Chairman, by reason of the fact that their figures are not subjected to the same public scrutiny as ours, we do not have that degree of precise information.

Mr. CANNON. What is your general impression?

Mr. STRAUSS. My general impression is that the British program is of about the same proportion as ours, that is to say, between 80 and 90 percent military, and the balance civilian, with great emphasis on the increase in the civilian program as a result of the power program which they have begun to intiate. Since, of course, in Great Britain the Government itself will be building their atomic power-plants, I would assume that in the not distant future that proportion will change materially, and that they will be even more heavily in the power business, per pound sterling appropriated, than we will.

The figures in France are not public. In any event, the amounts expended there are very small by comparison with ours, and that is true to an even greater extent in the other countries, other than Russia.

Mr. CANNON. You would say then that in France their program is negligible?

Mr. STRAUSS. I would say that, yes.

Mr. CANNON. On the other side, there is only one country and that is Russia, or is there production in any other country?

Mr. STRAUSS. There is production of uranium in Portugal——

Mr. CANNON. Well, Portugal would be considered an ally.

On the other side, of those who might be counted upon to oppose us either in war or in peacetime adaptation of electric energy, there is only one nation, and that is Russia.

Mr. STRAUSS. And her satellites such as Czechoslovakia.

Mr. CANNON. Is any work being done in this field in any of the Russian satellites?

(Discussion off the record.)

Mr. CANNON. Is the Russian stockpile presumed to be sufficient, if transportation were provided, to bomb our major cities and military centers?

Mr. STRAUSS. Mr. Chairman, an obvious qualification of an answer to that question, if any were made, it would be that, if they could deliver all the weapons they had on target, very great damage would occur. It would depend upon whether we had warning, how long ahead of the attack that warning was received, and the extent to which we successfully were able to intercept.

(Discussion off the record.)

Mr. CANNON. You do not take a very optimistic view of the situation?

Mr. STRAUSS. No; but I would have a far more optimistic view of our ability to detect an attack and to do something about it.

(Discussion off the record.)

Mr. CANNON. Of course, we are not considering military operations. We are merely considering here the supply of fissionable material.

The statement has been made in the newspapers that Russia is making more rapid progress in the development of fissionable material, and in the production of planes to deliver that material to the target. I realize we have no mathematically accurate information on that subject, but generally speaking, what is your impression?

Mr. STRAUSS. I have no impression as to their plane production other than the information I also read, Mr. Chairman.

Mr. CANNON. What about their supply of fissionable material?

Mr. STRAUSS. I do not believe that their production of fissionable material is as great as ours. I do not believe their production of weapons compares with ours. That is a matter of my belief.

Mr. CANNON. Would you say they are gaining on us, that our leadership is in jeopardy?

Mr. STRAUSS. Yes; I think when one person starts with something and the other man has nothing, and the other person then begins to accumulate, that he is gaining even if he does not make as many as rapidly, because the relative lead is changed. I can cite you a homely example of this which I have used on occasion.

A father has 2 sons, one 5 years old, the other 10. He says to the 10-year-old boy, you are now twice as old as your brother, and I want you always to continue to be twice as old. That relative lead is bound to diminish with the passage of time. Nothing that can be done will change it. When the Russians had no atomic weapons, and we had a supply, no matter how small our supply was, we had a relative position to them that we could never reestablish once they began to make weapons.

TRAINING OF SCIENTIFIC PERSONNEL

Mr. CANNON. I hardly think your illustration, as apt as it is, applies to our present situation. We are told that Russia is producing now, graduate engineers, mathematicians, and scientists in excess of what our schools are turning out.

Mr. STRAUSS. We believe that to be true, and we are much concerned about it.

Mr. CANNON. That being true, does it mean they will have a corresponding advantage in the future?

Mr. STRAUSS. If it is continued, it will make a very great difference; it will be very adverse to our interests and we must do something drastic immediately to correct it.

Mr. CANNON. You, of course, are dealing with scientific questions, and you are staffed with the most eminent American scientists of our time. Can you make any recommendation which would favorably affect this situation?

Mr. STRAUSS. I have had the effrontery to make two suggestions, sir, both of which I thought might have some value for the short range. I suggested that the learned societies might get their members to volunteer for a few hours a month in our secondary schools as teachers until the supply of teachers in the secondary schools could be made up. They can only be made up if the colleges of the country will require a minimum of credits in the natural sciences and mathematics for entrance. I do not know of any other way to do it short

of Federal assistance. I personally would be apprehensive of Federal assistance to the secondary schools by reason of the fact that the money would have to be collected from the taxpayers, and before it got back into the secondary schools it would be subject to all of the charges involved in the administration of a bureaucracy. I am constantly preaching this point to the presidents of colleges. I have made a number of trips around the country, so has Dr. Libby, so have the rest of us. In the last few months we have accumulated some impressive statistics and I think have begun to make a dent in the feeling on the subject.

Mr. CANNON. You think the leaven is already working?

Mr. STRAUSS. It is working, but not fast enough.

Mr. CANNON. What can be done to accelerate it?

Mr. STRAUSS. The President has appointed a committee on the subject, which had its first meeting in Washington about 2 weeks ago, to explore this question. Beyond that pressure from the White House I don't know of anything that can be done at the moment.

I would say this: if everything else fails, since I regard this as an important adjunct of national defense, for the Government to get into it would be a necessary last resort.

Mr. CANNON. What about accessories to scientific education needed to bring about the situation you desire? Do we have the necessary textbooks? Are such textbooks as we have sufficiently explicit? Do we have the laboratories and the apparatus required to adequately service the program you are advocating?

Mr. STRAUSS. I think, Mr. Chairman, at the undergraduate level, while there are shortages in the particular area in which the Commission is interested, we are undertaking to do something to supply it. But the great difficulty rests in the high schools, the secondary schools of the country, where a substantial percentage of those schools, some 47 percent, do not give the student an opportunity to study these subjects. They are not in the curricula of those schools. The president of a university in Ohio, whom I visited the week before last, told me that better than half of the students who enter into science courses at that institution drop out during the first year, drop out because of inadequate preparation at the high-school level.

Mr. CANNON. They did not have the foundation?

Mr. STRAUSS. They did not have the foundation. The teachers are not available because the high-school teacher who is qualified to teach physics, chemistry, or mathematics can make a better living today by going off into industry. We simply have to arrange to pay those teachers more. They will be paid more if the school boards find that the students from these high schools cannot enter college unless they have had a certain number of credits in those subjects.

Mr. CANNON. There should be minimum requirements for admission.

Mr. STRAUSS. Yes, sir.

Mr. CANNON. You think that of itself would improve the course of study in the secondary schools?

Mr. STRAUSS. Yes, sir, I do.

GENEVA SCIENTIFIC CONFERENCE

Mr. CANNON. You and the Commission, Mr. Strauss, organized and directed the Geneva Conference?

Mr. STRAUSS. We did not direct it, Mr. Chairman. We had a representative on the governing body, but aside from having initiated the idea, and having the resolution introduced in the United Nations, we were simply one of the participating countries. American scientists did, however, present some 500 of the 1,100 papers that were presented at the conference.

Mr. CANNON. Leaving out the natural patriotic impulse to emphasize our own achievements, what would you say about the relative merit of the 500 papers and the 1,100 papers? That is, when judged by practical results.

Mr. STRAUSS. I think it could be said that they included a large percentage of the most distinguished papers that were presented. I would not want to give you the impression that I was even qualified personally to evaluate them. A good many of them I could not even read.

Mr. CANNON. But it was easy to judge the general impression on the entire body at the conference?

Mr. STRAUSS. Yes, sir. This conference served to alert the world to the fact that the United States, which had been represented by Soviet propaganda as developing atomic energy only for war, had as a matter of fact made the most important contributions of atomic energy for peace.

Mr. CANNON. You think psychologically at least we achieved some advantage from this meeting?

Mr. STRAUSS. Very great advantage. The opening speeches and the concluding speeches all gave credit to the United States and to the President for having initiated the atoms-for-peace program, for having initiated the conference. There was a general era of good feeling and respect of which we are still feeling the overtones.

Mr. CANNON. There have been 2 or 3 articles in the appendix of the Congressional Record in the last week or so which seem to support the idea that America today is the best hated nation in the world. That although we have cooperated in every way possible in good will and in financial contributions to cooperative international enterprises, and to the welfare and development of each individual ally, our cooperation has not been appreciated. Do you think the results of the Geneva Conference emphasize or counteracted such an idea?

Mr. STRAUSS. By the Geneva Conference, you mean the Scientific Congress?

Mr. CANNON. Yes. The Scientific Congress.

IDENTIFICATION OF AMERICAN AID

Mr. STRAUSS. I think the Scientific Congress did us good rather than harm, Mr. Chairman. I have been as concerned, as I gather from what you have said that you are, about the reports that we are not liked in the rest of the world. I suspect that that will always be true of the rich and the prosperous in the minds of those who are neither rich nor prosperous. How to overcome it requires a specialist in human psychology. I am not that person. Following

World War I we conducted large-scale relief operations in Europe, spending of course far less money than we do today because the size of the problem was very much smaller. It was our custom, and I speak of this from knowledge, because I was a participant in it, that every shipment of food and clothing down to the smallest subdividable amounts, even if it were a bag of flour, bore conspicuously on it a lengend to the effect that it was a gift of the American people. I suspect that a great deal of what we have done in the rest of the world so generously is an anonymous contribution so far as the recipients are concerned. I don't know what to do about it, but if something could be done in the future to change that it might make a difference in the climate.

Mr. CANNON. Do you think it is possible we have not sufficiently emphasized or have emphasized too strongly the fact that these benevolent contributions came from the United States?

Mr. STRAUSS. I suspect we have through the best of motives. I was in a city, which I would not like to identify in order to avoid criticism of the individuals who were engaged in the enterprise, where I saw a very handsome union railroad terminal, one of which any American city would be proud. I was in a car with a member of the staff of the American Embassy in this particular country who told me with commendable pride that that had been built with Marshall plan funds. I said, "Do the people here know it? Is there anything on the station that indicates that fact?" He said, "I don't suppose there is, and I don't suppose there is a man on the street whom you can see who knows who did it." I think that perhaps is overlooking a bet. I am not sure.

Mr. CANNON. Are we making the same mistakes in the electrical energy field?

Mr. STRAUSS. I would suspect we are not. The one reactor which is now abroad that we supplied, sold to the Swiss, was installed in Geneva originally in a building plainly marked United States Atomic Energy Commission, with our seal on it. It was transferred by sale to the Swiss with appropriate ceremonies in which the American Minister to Switzerland and the President of Switzerland and various other people participated. The ceremony was broadcast over the Swiss radio and beautifully photographed, with suitable splash in the papers. If that is any augury of the future, I would suspect that everything that the Atomic Energy Commission does will be well publicized. As a matter of fact, we have given libraries of atomic energy publications to about 40 countries, and in each case we have done it twice. We have handed it to that country's ambassador here in Washington, and then to our ambassador in the country. In most of the countries, the presentation has been made all over again with as much publicity as could be achieved in each instance.

ATOMS-FOR-PEACE SHIP

Mr. CANNON. The newspapers speak of a matter, now under contemplation, of sending around the world a ship carrying an atomic unit to demonstrate the possibilities of atomic energy and our willingness to share them with our sister nations. Could you give us any information as to what is being planned, in that respect—the cost of such a program?

Mr. STRAUSS. Yes, sir. Last year the President proposed such a ship, which not only would carry an atomic unit, but which would be propelled by it. That would be its means of propulsion. This ship would go from port to port, would not have to refuel, and would carry a message of the peaceful application—not the military application—of atomic energy to the peoples of the world. This would be a merchant ship which would not only carry cargo, but would have equipment on board by way of exhibiting the peaceful uses of atomic energy.

The bill did not pass at the last session. It and a number of other bills to the same general effect, with various modifications, are before the Interstate and Foreign Commerce Committees, I believe, of both Houses. Senator Magnuson's committee had hearings about 10 days ago during which I testified. The proposed ship, if it is approved at this session, is one which will have a propulsion unit similar to that on the *Nautilus*. We know we can build it. We know the time in which we can build it. Within 27 to 30 months the ship can be launched. It will cost in the neighborhood of $40 million for the ship and the propulsion unit, and there is a somewhat greater sense of urgency——

Mr. CANNON. Will that be the total cost?

Mr. STRAUSS. The total cost.

Mr. CANNON. That is the cost of the material?

Mr. STRAUSS. Yes.

Mr. CANNON. That does not include cost of personnel?

Mr. STRAUSS. No, sir; that is the total cost for the complete ship.

Mr. CANNON. What would be the cost of operation?

Mr. STRAUSS. Can you answer that, Dr. Davis?

Mr. DAVIS. No; I am afraid I cannot offhand.

Mr. STRAUSS. We will supply that for the record.

Mr. CANNON. If you will.

(The information requested is as follows:)

A reasonable estimate of the annual cost of operating a nuclear-powered ship of the type proposed is between $2.5 million and $3 million, not including depreciation and interest, on the assumption of Government ownership. More precise estimates cannot be made in the absence of actual operating experience with nuclear propulsion systems. This estimate includes annual fuel costs of about $1.2 million and all other operating costs of between $1.3 million and $1.8 million. The latter estimate was developed from average operating cost data for comparable United States dry-cargo, passenger ships with conventional propulsion plants.

Mr. STRAUSS. And that need not be classified, either, except for the cost of the fissionable material in the core.

When it was first proposed by the President, we wanted this to follow as soon as possible after the Geneva Conference, but since that time new factors have been introduced. We know now that the Norwegians, the Germans, and British are working on similar projects. I mean surface propulsion of a merchant ship.

Mr. CANNON. Which would be used for the same purpose?

Mr. STRAUSS. No, sir; they would be used for commercial purposes. We have been informed by the Russian propaganda machine, whether it is true or not we do not know, that the Russians are working on an atomic-powered icebreaker which would also of course be a surface ship. The production of such a craft by the Russians or by our friends the British or the Norwegians would be a loss in prestige for us

and an unnecessary loss, since we know that we can build this ship, and we know the time limits within which we can build it and we know the cost figures within which we can build it.

Mr. CANNON. Up to this time the only ship powered by atomic energy is the *Nautilus*?

Mr. STRAUSS. That is the only one that is opeating. The *Seawolf*, the second nuclear-powered submarine, has her powerplant installed, but has not yet been accepted by the Navy.

Mr. CANNON. You would say that the *Nautilus* so far as its power is concerned is an unqualified success.

Mr. STRAUSS. An unqualified success in every way, Mr. Chairman. She has never been tried in combat, but she has been tried in every other way.

Mr. CANNON. And is equal to all expectations.

Mr. STRAUSS. Exceeded them, sir.

Mr. CANNON. The committee will stand adjourned until 2 o'clock.

AFTER RECESS

TRAINING OF STUDENTS IN SCIENTIFIC FIELD

Mr. CANNON. Mr. Strauss, continuing our discussion on the need for trained scientists and educational facilities to secure men qualified for this work, what would you say as to our present system under so-called progressive education? I refer to systems under which students are allowed optional courses, many of which do not require the concentration such as is necessary in mathematical and scientific courses. Would you say that a system which allows the students to make their own selection of subjects is draining away students from courses which would better serve the needs of your field?

Mr. STRAUSS. Mr. Chairman, I can only judge the system by its results. I cannot definitely say that it is the elective principle which is responsible or that it is the so-called progressive education that is responsible. Much more study would have to be given to it by qualified people who have more time than I have given to it. I can only say that the results of the system in effect over most of the country today, coupled with the other circumstances introduced by the civilization in which we live, have induced young people in the main, in a very large percentage, to elect courses that to us seem to be the easier courses. Perhaps to them these are the more appealing courses, the humanities, the academic courses. This reason may explain why they do not go into the sciences, that is to say, the natural sciences, and into mathematics, to the degree that they have done in the past.

A part of the blame there must inevitably rest upon the school authorities in those areas where, even if the students wished those courses, they are not available. One cannot entirely blame the students.

EMPHASIS OF SCHOOL SYSTEM

Mr. CANNON. I believe you said this morning that atomic energy is only 15 years old. Would you say that the needs of this special training are so new comparatively that our school system has not yet had an opportunity to employ it?

Mr. STRAUSS. Well, our particular enterprise is only 15 years old. It all began with the discovery of radioactivity 60 years ago, but our enterprise only began 15 years ago. Becquerel discovered radioactivity in 1896.

Mr. CANNON. At that time this phase of science was considered a rather sterile field. It was to be merely a matter of academic interest with little thought of practical application. Only recently, are we realizing the potentialities involved.

Mr. STRAUSS. The potentialities of it from the point of view of X-rays were realized considerably earlier, in the first decade of this century. Its use as a source of power is as modern as you have indicated, that is to say, in the last 15 years.

Mr. CANNON. It is possible that it will now receive more attention from those who formulate the courses of study?

Mr. STRAUSS. That is right. We will have in this country a very much larger number of qualified people than we have or are currently producing.

Mr. CANNON. Is the Commission taking any steps toward bringing this to the attention of school authorities?

DEFICIENCY AT HIGH-SCHOOL LEVEL

Mr. STRAUSS. We are establishing summer institutes. We are giving summer employment to professors who want either to brush up on their information on the subject or learn more about it. We are asking for authority to spend about $3 million to provide equipment to some colleges and universities in this country which are not adequately equipped to teach these subjects. We are helping other institutions like we helped the Pennsylvania State University, and North Carolina State to build research reactors. As a matter of fact reactors are in existence in those two places. We are encouraging the construction of accelerators at other universities. We are doing the best we can, Mr. Chairman, but the impact we are having is at the graduate level, and I think Dr. Libby and I and the other Commissioners who have given attention to it, and the members of our staff, feel that the deficiency is more fundamental. It is at the secondary-school level, the high-school level, and as a Commission we have no way to reach them.

Mr. CANNON. In postgraduate study, is it possible that men who have attained already an eminent position in physics and the other sciences have not had invitation and incentive to devote themselves to this particular field? For instance, are there college professors who have not been solicited to specialize on this work? What are you doing in the way of interesting trained graduates and specially trained teachers in the science departments of our colleges and universities? Are you giving attention solely to the secondary schools, or are you also appealing to the top echelon of our college faculties to interest themselves in this work?

Mr. STRAUSS. Mr. Chairman, as I said, we are not doing anything in the area of the secondary schools except the representations that we have been making to the Commissioner of Education, to the presidents of four great college associations in the United States, in the matter of stiffening their entrance requirements. But for a specific answer to your question as to what we are doing in connection with the professors and teachers and instructors of this subject at the

graduate and postgraduate level, I would appreciate it if I might ask Dr. Libby to address himself to that question.

ARGONNE LABORATORY

Mr. CANNON. And might you, also, Dr. Libby, tell us something about the Argonne Laboratory, and what, if anything, is being accomplished there?

Mr. LIBBY. The Argonne Laboratory is the center of our work in this area at the moment. We have a reactor school which is really just exactly what you described, Mr. Cannon, a postgraduate school. The students are graduate engineers and scientists before they come to the school. Then they spend something less than a year at the Argonne and at either Penn State or North Carolina, in a combination course. In less than a year, in 7 months, they have had a refresher or postgraduate course which is intended to introduce them into this new field of nuclear engineering, or nuclear technology.

We have a somewhat similar course at Oak Ridge. This, however, is a classified course, and is less suited to the kind of thing we normally encounter. The Argonne course, for example, not only has American citizens, but also has the foreign students attending from the various foreign countries. The Argonne course, I believe, is just as good a course as the Oak Ridge course, although the Oak Ridge classified course goes into more detail. Detail is not exactly the great substance in learning to be introduced into a new field.

In addition, this summer at Argonne we are bringing faculty members from various engineering schools in the country so they can brush up. As you pointed out, people who graduated more than 15 years ago need information, unless they happened to work in this field. It was not a very popular field prior to 15 years ago. So it is necessary to give them refresher courses so that they can—well, not exactly learn, but refresh themselves in this field.

We are doing that this summer at the Argonne. In this way we hope we will be able to transfer the burden of engineering instruction from Commission laboratories to the regular schools. These subjects should be taught in the regular engineering schools. Thus our program is a postgraduate education to fill the short-term need, which we may continue for some time. We also try to help the facilities in the regular engineering schools to become acquainted in this field, and to supply the expensive equipment needed in the laboratory instruction in this field on a loan basis from the Government. This action would permit schools like MIT, Carnegie Tech, the leading engineering schools, to take over the jobs of educating nuclear engineers. These are our plans.

Mr. CANNON. As a matter of fact, Doctor, the science of atomic energy is still comparatively in its infancy. The great discoveries of the application of atomic energy to industry lie ahead of us and you can offer even those who have had some years of teaching experience in higher educational institutions a field that ought to be rather attractive.

Mr. LIBBY. Yes, sir; I believe this is so. We have just begun to realize what a blessing this thing is. It is my belief that we will receive repayment many times over, many times over, for all the moneys invested, in benefits derived.

Mr. CANNON. And until our college faculties are trained in this respect, you are not in a position to offer such courses.

Mr. LIBBY. That is exactly right. It is a big porblem and we have to work hard at it. It is a very important problem. I think education and manpower are the most serious bottlenecks in the whole program, most serious.

EXPANSION OF PRESENT ACTIVITIES

Mr. CANNON. Mr. Chairman, taking up your budget, I note you are not asking for funds for new activities. Rather you are asking for funds for an expansion of your present activities. There is apparently very little that is new in your budget except that you ask to expand your present schedule.

Mr. STRAUSS. There is very little beyond expansion of our present activities. There is an increase in our operating budget because of the fact that we now have facilities and will next year have facilities to be operated which were previously in the course of construction.

CONSTRUCTION PROGRAM

Mr. CANNON. As compared with your construction program, you are not asking an increase. Is that due to the fact that you have now practically completed your plants and laboratories, and that you will need nothing in the future beyond operating expenses. Has your capital construction program been disposed of?

Mr. STRAUSS. Substantially, sir. The amount that we are asking for new construction is $306.6 million in obligations.

Mr. FIELDS. The appropriation would be $158.3 million, sir.

Mr. CANNON. What do you mean by obligation, Mr. Chairman?

Mr. FIELDS. This is authority for obligation against plant of that amount, sir.

Mr. CANNON. Contract authority?

Mr. FIELDS. Yes, sir. We would propose that it be funded by an appropriation of $158.3 million, and a reappropriation of $148.3 million of unobligated balances at the end of fiscal 1956.

Mr. CANNON. You know this committee has at times evidenced considerable lack of interest in contract authorization. We would rather you let us know what you want and what it is going to cost and give the committee an opportunity to pass on both the necessity for it and the cost of it, rather than extend contract authority. I am not speaking of this particular activity.

Mr. STRAUSS. Mr. Chairman, the witness is General Fields, the General Manager.

Mr. FIELDS. Mr. Chairman, our plant budget request is presented to you by projects, so that it will cover the entire amount of $306 million, for obligations. As you know, we require authorization for these projects in accordance with the Atomic Energy Act, section 261. We go to the Joint Committee for authorization for these projects. So this entire amount is broken down by project, and you can see against each project what we are requesting for them.

Mr. CANNON. Why not request the money rather than contract authority? We are inclined to consider requests for contract as evidence of incomplete thinking and incomplete planning. Cannot

we supply exact amounts for the purposes you indicate, rather than grant contract authorization?

Mr. McCarthy. Mr. Chairman, this is in terms of appropriations rather than contract authority as we usually think of it. It is in terms of appropriations, sir.

Mr. Cannon. The clerk tells me you may have used the wrong term.

Mr. Fields. I used the wrong term.

Mr. Cannon. And you really are not asking for contract authority?

Mr. McCarthy. That is correct, sir.

Mr. Cannon. I am glad to know that. I might say at this point that the committee has every reason to congratulate the Commission on the businesslike way in which it has handled its budget.

Mr. Strauss. On behalf of my colleagues, may I express appreciation for those comments. Those of us who are ex-businessmen are particularly gratified at that, and I am sure that is true of all of us.

SIZE OF MILITARY OPERATIONS

Mr. Cannon. There are few activities for which the committee is called upon to appropriate that are of more direct and immediate importance to the country. As you very well said this morning, it is one of the guaranties of world peace. It is the nearest guaranty we can have of adequate national defense. As long as we can maintain leadership in this field, we are in a position to meet any aggression which imperils the safety of the Nation or the peace of the world. For the present I believe you say something like 76 percent is for military purposes?

Mr. Strauss. For weapons and for military reactors, the amount comes to 86 percent.

Mr. Cannon. In that connection you spoke of provisions for the Navy. Just how do you increase the 75 percent to 86 percent?

DEVELOPMENT OF REACTOR TO PROPEL AIRCRAFT

Mr. Strauss. That does not fall entirely on naval reactors. Also included are reactors for the Air Force which I attempted to describe. I might expand a little bit to say, Mr. Chairman, that at Arco, Idaho, we are working to develop a reactor to propel aircraft. We were able some months ago to get it to drive a turbojet engine.

Then for the Army we are developing, as I said, a package power reactor, reactors, for example, which could be taken into the Arctic or off on remote islands to provide electrical energy without the necessity of importing oil to provide steam. They also have the further capability of being easily transportable. By reason of the fact that they are made in sections that are separable, they can be disassembled, flown to the base, and there reassembled and operated.

So that the difference between 76 percent—I think that was the figure—and 84 or 86 percent of our budget is accounted for by reactors of the several types I have mentioned. I believe that the naval reactors will represent the major part of that, because of the fact that they are more completely advanced, and that while the Army reactor and the aircraft reactor are still in the experimental stage, we know now that we can propel ships on the surface and under the water successfully. There is no guesswork there.

Mr. CANNON. I take for granted one of the difficulties in powering planes would be the question of the weight of the plant.

Mr. STRAUSS. Weight of the plant and that is largely the amount of the shielding material which must surround the plant to protect the occupants of the aircraft, and the material of which the aircraft is built, from the damage of radiation.

(Discussion off the record.)

Mr. CANNON. You confidently expect to be able to produce power machinery light enough to service a plane?

Mr. STRAUSS. I think I can say I confidently expect it, sir. The men who are working on it have that confidence. Their confidence in their ability to do it should have more weight with you than mine. I am not technically qualified to say this can be licked, but I believe it can.

Mr. CANNON. If you can apply atomic energy to plane propulsion, as successfully as you have to ship propulsion, you will have a plane that can fly indefinitely without refueling.

Mr. STRAUSS. Unlimited range.

Mr. CANNON. And it would be possible for you to considerably modify the design of the plane itself?

Mr. STRAUSS. I would presume that that would be the case to the extent that current design has any limitations on there for gasoline storage. But I don't know as of this date what changes in design of the carrier plane will be brought about as a result of nuclear propulsion.

Mr. PHILLIPS. Mr. Chairman, is your question in the general realm of design or of size? I think size is important, too.

REDUCED SIZE OF BOMBS

Mr. CANNON. Continuing the suggestion made by the gentleman from California, Mr. Phillips, you have already reduced the size of the bombs. I take for granted the bomb today is smaller than the bombs dropped on Nagasaki and Hiroshima.

Mr. STRAUSS. I will tell you, Mr. Chairman, if anyone suggested when I first became a member of the Commission in 1946, and when the principal weapon we had was a very large, a very heavy one, that we would ever be able to make a projectile that would fit into the bore of a gun and it would be an atomic weapon, I think most of us would have regarded it as completely fantastic.

Mr. CANNON. But you have now achieved it.

Mr. STRAUSS. That has been achieved. More important progress has since been made, but that has long since been achieved, and it has been publicly announced.

(Discussion off the record.)

ACCOMPLISHMENTS

Mr. CANNON. We would like to know what is the trend of your accomplishments. What results are you getting? Are you making progress?

Mr. STRAUSS. I can say this, Mr. Chairman. The Commission has achieved great success, the people who work with the Commission have achieved great success in diminishing the external dimensions and the weights of the various things with which we deal.

That applies to weapons, it applies to reactors. The idea that anyone would put a reactor inside the narrow hull of a submarine, I think in 1945 would have seemed quite a dream. It has been accomplished. I suspect that before we are many years older that there will be very much smaller reactors than that one.

HAZARDS OF PRODUCTION AND UTILIZATION OF REACTORS

Mr. CANNON. In that connection, Mr. Strauss, you mentioned hazards in the production and utilization of nuclear products. I note the National Academy of Sciences seemed to be concerned about the effects of radiation upon those who utilize your products, both as war material and industrially. The Academy left the impression that some steps ought to be taken immediately to reduce the danger of radiation. Just what danger is there?

Mr. STRAUSS. I am glad you have given me an opportunity to talk about this, Mr. Chairman. The headlines, particularly of the Washington Post this morning, were alarming and did not reflect the text of the Academy's report. The circumstances are these. Last year the Rockefeller Foundation said to us that they would like to support a study on the effects of radiation on human beings, and it was at our suggestion that they financed the National Academy of Sciences to make that study.

The National Academy of Sciences is, as you know, a body chartered by the Congress in the time of the War Between the States, and it is independently financed, but it has an official status.

Mr. CANNON. It is a Government agency?

Mr. STRAUSS. It is a Government agency in the sense that its existence was authorized and recognized by the Government, but it is independently operated. It selects its own members, its own officers, and it is completely nonpartisan. It has no political affiliation or overtones whatsoever. It is a self-perpetuating body of the most eminent men in all of the sciences of the country.

Mr. CANNON. Is it both federally and privately financed?

Mr. STRAUSS. It is only privately financed. As far as I know, it receives no Federal money, except when it may be called upon to undertake some sort of function, as during the war it did.

Mr. PHILLIPS. Mr. Chairman, I am not sure I understand what body he is talking about.

Mr. STRAUSS. The National Academy of Sciences.

Mr. PHILLIPS. I thought you said the National Science Foundation. It surprises me that they have no money.

REPORT OF NATIONAL ACADEMY OF SCIENCES

Mr. STRAUSS. In any event, they appointed committees of eminent and qualified men who worked with the Commission over the past year, and they produced a report which was made public yesterday. The report said in part—and I am able to give you not a direct quote, but almost a direct quote, because during the lunch hour I was reviewing part of it—that there were three sources from which human beings received radiation. One was from normal background. By normal background, they meant the radiation from cosmic radiation from outer space, from the radioactive materials that are present in

all soils and rocks, and from the radioactive materials that are present in our own bodies. There was a certain amount of radioactive phosphorous and even radium in the structure of our own bodies.

The second source from which we received radiation is from medical X-rays and fluoroscopy, and the third from the effects of fallout from atomic weapons testing.

The result of that examination over the past year led them to the following conclusion: That over the lifetime, the reproductive lifetime of a man in the United States, he received from normal background radiation 4.3 roentgens, and from X-ray and fluoroscopy, 3 roentgens, and from the effects of weapons tests assuming they are continued at the present rate, all through the years, an amount that they figured at one-tenth of a roentgen. They said that that figure of one-tenth of a roentgen could be off by a factor of five. That is to say, it could either be two one-hundredths of a roentgen or half a roentgen. In other words, that from all the testing to date, and all the testing that will be carried on in the next 30 years assuming it is at the present rate, you might receive anywhere from one-fourteenth to one three-hundredths of the amount you are going to get anyhow from medical X-rays and from the fact that you are walking around on the ground.

Now, despite that statement, repeated over and over again in their report, a newspaper came out here in Washington this morning with 96-point-type headline, "World in Peril by Atomic Radiation."

Mr. CANNON. You are familiar, of course, with the article appearing in the Saturday Review recently by Dr. H. J. Muller, in which he indicated that he thought the Commission was a little too liberal with its permissible dose standards and thus negligent in providing adequate safeguards.

Mr. STRAUSS. With respect to that, I can only say that we announced these very figures, almost precisely the same, a year ago last February, February 15, 1955. We are very gratified to see that these gentlemen came out with the same figures. This report is full of references to the fact that we do exercise proper safeguards, that we are even more conservative than they think we need to be.

I am reminded that Dr. Muller signed this report of the National Academy of Sciences. He was a member of the committee, so that anything he may have written previously in the Saturday Review has certainly been modified as a result of his exposure to the facts.

Mr. CANNON. You have educated him.

Mr. STRAUSS. Somebody has. We have not. But I am grateful to the National Academy of Sciences for having included him. I am trying to locate the particular paragraph that accuses us of ultra-conservatism, an accusation, sir, that we bear with not too much complaint.

Mr. CANNON. You may include that later.

(NOTE.—The excerpt from the report of the National Academy of Sciences titled "The Biological Effects of Atomic Radiation, Summary Reports," is as follows:)

It should be noted that the figures on fallout as stated by the Atomic Energy Commission make only a conservative correction for weathering and shelter; and thus their figures, at least in regard to this point, tend to overstate the danger rather than the opposite.

Mr. STRAUSS. I assure you that it is present in the voluminous pages of the report.

Mr. CANNON. In the report which was issued yesterday they emphasized two things which are causing some apprehension. In the first place they said it would modify the genes and thereby affect heredity. In the course of your studies of the effect upon the Japanese people of the bombs dropped at Hiroshima and Nagasaki, did they find any change in the character or physique of the offspring of those who were subjected to radiation at the time?

Mr. STRAUSS. Dr. Libby, are you familiar with the details of that?

Mr. LIBBY. I would prefer to have Dr. Dunham answer that, Mr. Chairman.

Mr. CANNON. That was 10 years ago. There has been ample opportunity to study the situation at firsthand. Can you give us a report now as to what has been found?

Dr. DUNHAM. They have studied 40,000 births in the cities of Hiroshima and Nagasaki. Less than 2,000 of these, however, were from parents who were heavily irradiated. In comparing the offspring of the irradiated parents with those of the unirradiated parents, there was not a statistically significant difference in the number of mutations or abnormalities at birth within the two groups. On the other hand, the numbers involved were not great enough to have detected small differences which might have been detected if there had been a million births. So that in one sense the observations are negative. On the other hand, they do not prove that there were no mutations produced by irradiation in the offspring.

One of the reasons for this is that the mutations produced by radiation are in no way different from those which occur naturally, so they do not stick out, and you cannot say this one was due to radiation, whereas that one was not. Do I make myself reasonably clear?

Mr. CANNON. After 10 years' study of hundreds of cases, you would say there is no ground for believing such radiation has had a deleterious effect?

Dr. DUNHAM. All we can say is that they did not demonstrate an effect, and that there is no reason to believe that if there had been many, many more children to study, there might not have been demonstrated a small effect.

Mr. CANNON. When was that report issued?

Dr. DUNHAM. The big report which Dr. Neal and his group have compiled is now in progress of being edited finally for publication. A preliminary report was issued, I believe, in 1952 or 1953, on the preliminary data. The subsequent work I do not believe changes the original conclusions as I summarized them a moment ago.

Mr. CANNON. Mr. Strauss, you believe there are undoubted dangers in exposure to radiation?

Mr. STRAUSS. We do, and we spend a great deal of time in the discharge of what we regard as terrific responsibility that we carry to protect the public from the indiscriminate use of radiation-producing devices. For example, we do not send radioactive isotopes to every applicant for them. The applicant must justify the fact that he knows how to handle them. We are concerned, for example, that if the indiscriminate building of reactors all over the United States and all over the world where effected with a proper control of the people

who were to own them and operate them, there would be hazards to the population, and that is one of the reasons why we take what some of our friendly critics consider a very long time in passing on the applications to build a specific type of reactor.

Mr. CANNON. We have understood, Doctor, that in addition to these dangers from radiation, there is the additional danger that the plant may take the bit in its teeth and run away with us. We were told there was such an instance in one of the Canadian reactors. We would be glad if you would let us know what chance there is of such a catastrophe which will affect the entire community.

Mr. STRAUSS. Mr. Chairman, the fact is that in our own operations we have deliberately produced events of that sort in order to see what would happen. We have had no explosions of a reactor. I am not familiar with the details of the Canadian event, and I will ask that it be described to you in a moment, but it was not an explosion, it did not produce any catastrophe. On the other hand, you asked, "Is there a chance?" Yes, there is a chance, and it is that fact that there is one chance in some very large number—1 in a million or 1 in 10,000 or 1 in 10 million, I don't know which—that makes us proceed with caution and makes industry wish to be insured against the possibility of such an eventuality.

CANADIAN REACTOR INCIDENT

Is there any member of the staff who can discuss the Canadian incident to which the chairman has referred? Can you, Mr. Davis?

Mr. DAVIS. I am not completely aware of all the details, but what happened was that at the time the cooling in the reactor was reduced very greatly, there was a mistake in the operation which caused some of the fuel material to melt. What it did was to allow some molten uranium to fall into a large part of the tank which contaminated the heavy water which they had in the tank. A small amount of fission product did escape into the atmosphere. But no one was injured. There was not anything in the way of an explosion. It was just a rather costly accident to the reactor from the point of view of the Canadians.

Mr. CANNON. Some accounts of the incident in the Canadian plant have indicated that it was so serious they had to summon help from outside, that outside experts were rushed in by plane, and the situation was so acute that they could work only 10 minutes at a time before they could finally control it.

Mr. STRAUSS. Mr. Chairman, the outside help was ours. You were inquiring this morning as to the degree of cooperation between us. We have many more technicians than they have. We had supplied the fuel elements for the Canadian reactor. We were glad to help them clean this up, not only as a friendly gesture, but for what we would learn from it in the event of any such experience in our reactors. The fact that these men were limited to 10 minutes or an hour or whatever period of time in the contaminated surroundings was an arbitrary arrangement established by the Division of Biology and Medicine of the Commission in order to assure the fact that we were not subjecting our employees to an exposure that would have occasioned them injury. This does not mean that it was too uncomfortable for them or anything of that sort. It might have been dangerous had they remained for longer periods.

Mr. CANNON. Such an incident could take place in any reactor, and if not promptly controlled, could be disastrous?

Mr. STRAUSS. Not precisely similar mishaps, Mr. Chairman. The difference in the design of reactors would mean that the kind of thing that could happen would be different, just as an accident to the operators of a diesel engine would be different than that which might happen to operators of a steam engine. There are some reactors in which the fuel is liquid. There are other reactors in which the fuel is solid. There are some reactors which are cooled by gas, others which are cooled by water, others which are cooled by liquid metal. A whole variety of accidents or mishaps might occur as a result of mechanical failure of parts that might have nothing whatever to do with the peculiarity that it was an atomic reactor.

SAFETY RECORD

These are the kinds of conditions which industry faces. I can only say to you that until this year, and I hope the same will be true this year, our accident record has been lower than that of any industry in the country with the exception of one category. We had the second lowest accident rate of any industry in the United States, and received two safety awards in consequence.

Shortly after getting these awards, we did have some accidents, not having to do with the nuclear portions of plants. Some hot material, some acid material fell on some people. But there have not been nuclear accidents in the sense that they were concerned with radioactive material. Our accident record was impaired quite recently.

Mr. CANNON. The newspapers this morning include a report released yesterday that the National Academy of Sciences advises that for the present at least reactors located near population areas should be sealed against accidental release of radioactive materials.

Mr. STRAUSS. That is in the conclusion, but in the body of the report you will find that that particular sentence is followed by another one, saying that the Atomic Energy Commission follows this as its consistent policy. I am sorry they left it out of their conclusions.

Mr. CANNON. You gave us an interesting statement this morning on the different kinds of atoms—I think you said a thousand different forms of atoms.

DEVELOPMENT OF DIFFERENT TYPES OF REACTORS

You also noted in your statement a number of ways of producing atomic energy. You say you now have five reactors, each of which is capable of producing electric energy by a different method. In addition you indicate 3 more, which would aggregate a total of 8 reactors. I suppose your program is one of experimentation to determine which is the least expensive, which is the most efficient, and which is the least dangerous method of producing atomic energy. Is it possible that in addition to these eight methods, there may be other methods which will be developed in the future?

Mr. STRAUSS. There are many methods, Mr. Chairman. It used to be said that the number of different types of reactors was limited only by the number of engineers and technicians who were working with us. Of course that is obviously an exaggeration. There are minor modifications which one would not necessarily describe as a

different type but every type that is promising in the opinion of the Commission and its Reactor Development Division is either today building or projected as a prototype or full-scale plant or is in active investigation in one of the laboratories of the Commission.

Mr. CANNON. Have you up to this time advanced sufficiently to say which of these methods is the most efficient and practical?

Mr. STRAUSS. No, sir. If we were able to say that with any degree of assurance, we would be well along toward the development of economic power in the United States. There are arguments in favor of each of these types, and we will not know until they have been bult and have been operated for a period of time.

Mr. CANNON. How much time?

Mr. STRAUSS. Dr. Davis, what would you say would be the minimum period of the operation of a reactor before you would feel that it had demonstrated both its qualities and its shortcomings?

Mr. DAVIS. I would say generally you would have to operate a reactor probably 2 or 3 years before you would find out such significant things as the ability of the materials to stand up against the radiation or the corrosion, find out about the life of the fuel elements in the reactor, things of this sort. Certainly this would be a minimum time to learn anything of any significance about the economics of a large scale reactor.

ATOMIC ELECTRIC POWER COMPARED WITH CONVENTIONAL ELECTRIC POWER

Mr. CANNON. Are you now producing atomic power in any of these reactors at a price which would compete with the production of electric power by conventional fuels?

Mr. STRAUSS. That question would require a qualified answer, Mr. Chairman. There are places in the world where conventional fuels are nonexistent, and so expensive that if you had a plant there based on any one of these designs it would be economic by those standards. But we have no plant today, and know of none today, which would be competitive with power produced by conventional fuels in the United States, and nothing, of course, that would compete with the cost of hydroelectric power. We are confident that we will reach that point, but we have not at this time.

NEED FOR ATOMIC ENERGY COMMISSION PROGRAM

Mr. CANNON. There appears in today's Washington Star a page advertisement. It does not say exactly who is vouching for the information or who is paying for the advertisement, but it is signed "America's Independent Electric Light and Power Companies." It says the problem of producing electricity from the atom was solved long ago. If this statement is true and the problem is now solved, there would appear to be little left for the Commission to do.

Mr. STRAUSS. I think that statement probably means that the problem of producing electricity from the atom is solved. They don't say economically. The problem of producing it has been solved long ago. This is correct. The *Nautilus* is an instance of it. The town of Arco, Idaho, was lighted by power from the reactor at Arco, and power from the West Milton prototype plant was turned into the

grid in northern New York for a short while in the summer of 1955. That statement is correct as it stands.

Mr. CANNON. When we read the context we don't get the impression that is what they mean. They start in by saying that the problem was solved long ago. That cannot be correct. If it were there would be no need for the program the Atomic Energy Commission is submitting here today.

Incidentally, a member of the committee just now suggests that it is not a coincidence this article appears on the day that the Commission appears before the committee to be heard on its budget and during the consideration of the Gore bill in the Senate committee. It says—

> The problem of producing electricity from the atom was solved long ago, but as long as we have adequate supplies of coal, oil, and gas that can produce low price electricity, it would be wasteful for America to build large numbers of atomic electric powerplants which could produce electricity only at high cost.

That leaves the impression that they could be built at any time, that the art is sufficiently advanced that they at any time can produce the electricity in this way.

Mr. STRAUSS. I have no idea of the purpose and the timing, and I want to be sure that you know perfectly well that this is not Commission inspired. It had nothing whatever to do with this hearing.

Mr. CANNON. I don't know how many more, but 2 alone would cost approximately $3,558. A member of the Senate estimates the total cost of this one advertisement in excess of $100,000. They spent this amount in these two papers here in Washington alone to make the statement that the problem of producing electricity from the atom was solved long ago. Why would they spend $100,000 to get that statement before the public?

Mr. STRAUSS. I have no idea, sir.

Mr. EVINS. Will the Chairman yield? I might supplement the Chairman's statement by adding that similar advertisements are appearing in many of our national magazines such as U. S. News and World Report, and also ads financed by the electric power industry are now appearing in the American Legion magazine that goes to veterans all over the country.

Mr. JENSEN. They are spending their own money. They have a perfect right to do it. It is still a free country.

Mr. PHILLIPS. I was wondering how much the Latex Co. has probably paid for advertisements supporting the former administration. They were the recipient of Federal funds.

Mr. CANNON. Here is a letter:

NUCLEAR POWER PROGRAM

Leading daily newspapers, carry a full page advertisement sponsored by America's independent electric light and power companies, entitled "How America Will Keep Its Lead in Atomic-Electric Power."

The clear implication of this advertisement is that America now possesses such a lead and that there are several nuclear reactors producing commercial quantities of electric power in the United States. The advertisement lists 55 nuclear reactors as presently completed in the United States, and adds, though in substantially smaller type, that these reactors are of "all types and for all purposes."

The truth of the matter is that nearly all existing reactors are experimental. Most are owned by the Government. There is not one—not a single nuclear reactor—operating in the United States for the purpose of producing commercial

quantities of electric power. I direct your attention to pages 9181 through 9188 of the Congressional Record of Wednesday, June 13, wherein this advertisement is severely criticized and pointedly rediculed by Senator Clinton Anderson of New Mexico, chairman of the Joint Congressional Committee on Atomic Energy, and by Senator Albert Gore, of Tennessee, a member of that committee.

Each of these Senators has devoted a major portion of his time during recent years to the study of problems associated with the military and peacetime uses of atomic energy. Each was obviously shocked by the advertisement.

Senator Gore said, in criticizing the advertisement on the floor of the Senate, that the private power companies spent approximately $100,000 for the publication of the advertisement "to mislead and misinform the American people on the nuclear power program." Senator Anderson described it as a "marvelous piece of work in which the electric companies can take no pride."

Senator Gore recalled that Mr. Elmer L. Lindseth, representing the electric utility industry, had previously told the Joint Committee on Atomic Energy that there were 89 reactors in the United States, either completed or under development, planned or applied for. One of the reactors listed by Mr. Lindseth in his testimony was the boiling experimental reactor known as Borax 1.

This was a very small experimental reactor which was purposely destroyed many months ago in order to secure basic physical data. Yet, this reactor was listed by the private power companies as part of the American program for utilization of nuclear fission. Mr. Lindseth also included as one of the existing or planned reactors in the United States a reactor known as Los Alamos fast Clementine reactor. That reactor has been dismantled.

During Senate criticism of the misleading advertisement Senator Gore stated:

"Of the 55 referred to in the advertisement as completed in 1956, not one plant is able to produce electric power in commercial or industrial quantity and of the 35 listed as being built or planned, only one is under construction."

Mr. Elmer L. Lindseth, the private utility industry representative, admitted himself, during hearings by the Joint Committee on Atomic Energy, that:

"To my knowledge, there is no reactor other than a military reactor producing power in the amounts which Senator Gore has limited the question to, 5,000 kilowatts."

In other words, although the electric power industry admits before a congressional committee that there is no reactor in the United States producing reliable power in amounts even as low as 5,000 kilowatts, that same industry pays $100,000 of its rate-payers' revenue to finance a full page advertisement likely to induce a sense of false security in the American people and to persuade them that the privately owned electric companies are engaged in a full scale program of nuclear reactor construction.

During Senate criticism of the advertisement, the fact was clearly established by Senator Anderson that a 5,000-kilowatt nuclear powered electric generating station has been in operation in Russia since 1954. There is no such station yet in operation in the United States.

Senator Anderson said, during the debate, that:

"We have been trying in every way we can to help the electric industry get off the ground. But this advertisement is the sort of thing that sinks the industry back to earth again."

Some of the electric utility companies were even themselves ashamed of this advertisement. Senator Anderson reported in the Congressional Record that one president of a power company had told him:

"I want you to understand that my company had no connection whatever with this."

The very publication, without comment, of this advertisement in so many major newspapers throughout the country is, of itself, a disservice to the Nation. But what is more tragic is the fact that your paper gave no news or editorial coverage to the replies of men like Senator Anderson, who is chairman of the Joint Congressional Committee on Atomic Energy, and Senator Gore, who is a member of that committee. Each of these men saw fit to use the valuable time of the United States Senate for a detailed criticism which completely refuted the validity of the advertisement, yet their remarks went unreported.

The American tradition of freedom of the press is not a concept designed for the benefit and convenience of the newspaper industry. The framers of our Federal Constitution realized that the survival of a democracy depends upon a free flow of information to and between the people. To allow the utilization of our media of mass communication for the presentation of one side of a national controversy vitally affecting the continued integrity and security of the United States may not

be a violation of the technical concept of a free press. It certainly is a violation of the concurrent responsibility of the press to furnish the people with information rather than with the unchallenged propaganda of special groups devoted to their own self-perpetuation.

CHARLES A. ROBINSON, Jr.,
Staff Engineer, National Rural Electric Cooperative Association.

ARMY PACKAGE POWER REACTOR

Mr. CANNON. I notice you are working on the Army package power reactor.

Mr. STRAUSS. Yes.

Mr. CANNON. It can be disassembled and moved.

Mr. STRAUSS. That is right, sir.

Mr. CANNON. I take for granted that weight and bulk is a factor.

Mr. STRAUSS. It is, indeed.

Mr. CANNON. That you are really solving that problem and that already you are demonstrating that this Army package power reactor is practical?

Mr. STRAUSS. We believe it is practical and transportable in sections.

Mr. CANNON. I see that you say in your statement this morning that—

Experience shows that much of the technology being developed from military reactors will also be applicable to reactors for civilian power.

Mr. STRAUSS. Yes, sir.

Mr. CANNON. Can we say that is one of the hopeful signs of the times, that in that way we expect to beat our swords into plowshares?

Mr. STRAUSS. Yes, sir, the reverse is also true, that is to say, that the technology that is put into military reactors is helpful to the civilian reactor, and the reverse. These things mutually complement one another.

Mr. CANNON. And the more applicable this is to industry, the safer the country is because in making progress in developing a form of energy that can be used for the defense of the country we are developing an agency that will contribute to the prosperity of the country.

Mr. STRAUSS. Mr. Chairman, I know this is speaking personally, and I believe on behalf of my colleagues and most of my associates in the Commission. It is that realization that keeps us on this job. Most of us could do other things more profitably, individually more profitably, but it is because of our conviction that what you have just said is so that we are here.

Mr. CANNON. The gentlemen from Rhode Island.

YANKEE ATOMIC POWER REACTOR

Mr. FOGARTY. Mr. Chairman, I would like to find out what has happened to the contract for the Yankee atomic power.

Mr. STRAUSS. I am happy to tell you it was signed by the General Manager of the Commission on June 6, 1956.

Mr. FOGARTY. When was this application first made?

Mr. DAVIS. April 1, 1955.

Mr. FOGARTY. It took over a year to process it. Is that the usual time required for processing?

Mr. STRAUSS. I can explain that. In the first place there was a difference of opinion in the Commission as to whether this contract

should be executed or not. This was not a unanimous decision. It was a decision by a majority of the Commissioners.

In the second place, this contract was carefully reviewed by our reactor safety people, by our legal people, by all of the various divisions of the Commission, until it reached the General Manager with their recommendation, and upon the General Manager's recommendation to the Commission, we took action by a majority vote.

Now, I grant you that the time seems long, but to have approved it out of hand, I think would not have been possible if we were to sleep afterward. We have a terrific responsibility in approving the building of any reactor in a populous area.

Mr. FOGARTY. I realize that, but I did not think the division of opinion in the Commission was a contributing factor.

Mr. STRAUSS. It is one of the factors that delayed the deliberations for a period of time.

Mr. FOGARTY. About how long would you say it delayed the decision?

Mr. STRAUSS. I could not say offhand, sir, but I would say a matter of weeks, perhaps even months, as we attempted to get unanimity.

Mr. FOGARTY. Now that the contract has been signed, what is the next step?

Mr. STRAUSS. A license has been issued. Am I correct? Will you answer thq eustion, General Fields?

Mr. FIELDS. The company will move forward now. They have been developing their plans. I presume at this point they will be making contracts for the actual construction of the plant. The contract just being signed clearly gives them all the indications to go forward. Up to this point I understood they had not made any contracts with equipment manufacturers in this area, and they would move forward with that.

Mr. FOGARTY. Now, where does the license come in?

Mr. FIELDS. The license application will be coming in to us—is it in yet?

Mr. PRICE. No, sir, they have not applied for that license. They have been aware of the need for this ever since they filed the application for the contract.

Mr. FOGARTY. You mean they filed the application in 1955, and they knew at that time they should have filed application for a license and have not done so at this period?

Mr. PRICE. They did not need to file the application for a license at that time. They first wanted to negotiate the financial arrangement which they have been doing. They know and have known since then that in order to proceed they will have to file an application for a license so that the plant can be licensed.

Mr. FOGARTY. In your opinion, then, what should they have done, or when should they have applied for a license?

Mr. PRICE. Sir, I don't know that any particular time is the right time. I don't know what considerations led them to wait until they had completed their contract negotiations before they would come in with their license application. It could be that they wanted to get further along with some of their design work before filing their license application. I do not know, sir.

Mr. FOGARTY. Now, have they been issued a construction permit?

Mr. PRICE. No, sir. That would be issued pursuant to the application for a license.

Mr. FOGARTY. So they will not get a construction permit or will not qualify for a construction permit until they have been granted a license.

Mr. PRICE. That is right, sir—until they have applied for a license and it has been evaluated.

Mr. FOGARTY. As soon as they have applied for a license, then they may qualify for a construction permit, is that correct?

Mr. PRIDE. That is correct, if their application meets the requirements of the law and the regulations.

Mr. FOGARTY. Is there anything that you know of at the present time that would cause you to have some apprehension about whether or not they would qualify for a construction permit if granted a license?

Mr. PRICE. Nothing that I know, sir.

Mr. FOGARTY. I would put the same question as far as the license is concerned.

Mr. PRICE. That is right, the same answer.

Mr. FOGARTY. You think that everything is fairly well in order now to proceed?

Mr. PRICE. Nothing that we know would prevent them from getting a construction permit and license, but, of course, they have not submitted the information that is necessary for the Commission to review in order to issue one.

Mr. FOGARTY. Do I follow you correctly now that their next step should be to let the contracts before they receive a license?

Mr. STRAUSS. The contract to the suppliers?

Mr. FOGARTY. Yes, and designers.

Mr. STRAUSS. I would think so. They probably feel, and this is just a guess on my part, that the subsequent steps with us are pro forma. That is my guess.

Mr. FOGARTY. That is the usual procedure then, is that correct?

Mr. STRAUSS. Yes.

Mr. FOGARTY. When the contract has been signed it is the usual procedure that the license follows unless something develops that you do not foresee at this time.

Mr. STRAUSS. We cannot call it usual procedure, sir. This pro cedure is so new that nothing in it is usual as yet. This is one of the very early proposals.

Mr. FOGARTY. Now, what about the insurance part of these programs?

Mr. STRAUSS. That is before the Congress at the present time.

Mr. PHILLIPS. You mean liability?

LIABILITY INSURANCE

Mr. FOGARTY. Yes. Now, what recommendations have you made to the Congress about the third party liability?

Mr. STRAUSS. We have submitted a proposed bill and have testified at length about it before the Joint Committee, I understand that Senator Anderson, the Chairman of the Joint Committee, has

presented his own bill which differs in some particulars from the one which we had. We have consulted with the Bureau of the Budget as to whether we might go along with Senator Anderson's bill. Have we had a reply?

Mr. MITCHELL. The situation is that the Joint Committee is holding further hearings tomorrow morning, both on the bill that the Commission presented, and on the bill presented by the committee. We have obtained clearance from the Bureau of the Budget of our comments on the committee bill which although we can go along with it, we do suggest some revisions in it.

Mr. FOGARTY. But in general the Anderson bill would be acceptable?

Mr. MITCHELL. Yes, sir; in its major aspects.

Mr. FOGARTY. And it would overcome and solve this insurance problem, is that correct?

Mr. MITCHELL. We think it would, and we have no objection to the major provisions of the bill.

Mr. STRAUSS. We are very anxious to have it approved at this session. If it is not, it will delay the inception of these construction programs for another 6 months.

Mr. FOGARTY. That has been one of the holdups, has it not, the insurance problem?

Mr. STRAUSS. That is right.

Mr. FOGARTY. Because insurance companies just would not take that——

Mr. STRAUSS. The insurance companies have stepped up to the bar and have agreed to take 4 to 5 times as much insurance on atomic plants as they have ever agreed to take on any single industrial plant. I believe that is correct, is it not, Mr. Price?

Mr. PRICE. It is $65 million as against the highest that we know about that they have ever insured a single plant for before, somewhere around $15 million.

Mr. FOGARTY. What would be the ultimate cost of insurance of one of these plants?

Mr. STRAUSS. Depending on the size of the premium on the amount over the $65 million, that is to say, whether the Government took a simple nominal premium on it, or whether the premium was a graduated premium, or what.

Mr. FOGARTY. If the insurance company would insure this particular plant for $65 million, suppose the plant cost $200 million——

Mr. STRAUSS. That is not the question. The third party liability. Most of the industries would have no hesitancy in insuring the liability for the loss of their own property. It is the damage to third parties that concerns them.

Mr. FOGARTY. How much would that amount to? Can you ascertain what that cost would be, or estimate what that cost might be?

Mr. MITCHELL. The Anderson bill provides for an annual charge by the Government for the indemnity coverage which it provides of $10,000 for reactors which are licensed as commercially practicable, and something less than $10,000 annually in the discretion of the Commission for experimental and developmental reactors. Of course, we don't know yet what the charge will be for the initial $65 million by the private insurance companies. This still has to be worked out.

Mr. PHILLIPS. Mr. Fogarty, would you clear up something, and may I ask a question to clear it up? Do I understand that no bill is

proposed or no request made for insurance covering the plant itself, that is by the industry itself, if they have an explosion, no insurance has been asked for this?

Mr. MITCHELL. So far as Government participation is concerned, Mr. Phillips, this is right.

Mr. PHILLIPS. Secondly, when you say third-party liability, do you actually mean to a person or do you mean to property belonging to a third party?

Mr. MITCHELL. It will be both, Mr. Phillips.

Mr. FOGARTY. Now, in this particular reactor in New England, are you in any position to say whether or not this will ever blow up or run away, which is the expression that is used?

Mr. STRAUSS. Well, sir, our people believe that it is a safe reactor. Otherwise, we would not have been willing to go ahead with it. But there is the possibility that every reactor that is built could run away. That is a possibility with respect, I suppose, to every automobile that has gasoline in its tank; it could catch fire. The fact that we are willing to see it built, and willing to see it built in a populous area, the fact that we are willing to see the *Nautilus* come into New London and tie up at the dock with the same kind of reactor, the same general use of reactor aboard her, is an indication that we think that this is a risk with which one can live. I would have no hesitation in living next door to it myself.

Mr. FOGARTY. A while ago, Commissioner, you stated that maybe it might happen once in 10,000 times, or once in a million or once in 10 million times. Now, if that is your best guess, or if it happens only once in a million times, why are the insurance companies so hesitant about this third-party liability?

Mr. STRAUSS. Because, sir, I have no way of assuring them, nor has anyone else, that that millionth time will not be tomorrow or the next day. It is the same principle upon which the actuarial tables are made for your life insurance. You may have a life expectancy at your age of another 40 years on the basis of the whole coverage of the population, but the individual insuree of that age might die the following day.

Mr. FOGARTY. That is true as far as you go, but you know in the last 15 or 20 years the life expectancy has risen considerably, maybe 10 years, but the cost of the policy has not come down in a comparative way, has it?

Mr. STRAUSS. I don't know enough about the life-insurance business, sir, to know whether it has come down comparatively. There has been some decline in the cost of insurance.

Mr. FOGARTY. But not nearly as much as the rise in the expectancy of life has been in the last 25 years.

Mr. STRAUSS. I will accept your statement, because I don't know. I will say in the matter of insurance against risk from atomic reactors, that with experience the coverage of the private insurance companies will be increased, and the rates will decrease. I imagine if Mr. Edison had attempted to get insurance for his first electric plants—perhaps he did; I don't know—today the rate on them for damage to third party would be very much less than it would have been at the outset.

Mr. FOGARTY. So that the net effect is, then, that private enterprise cannot handle this particular problem, that they have to come

now and seek some relief from the Federal Government? Is that a fair statement? The net effect of this colloquy we have had on the insurance problem is that private enterprise has not been able to meet the problem and they have to seek some relief from the Federal Government so far as insuring third-party liability?

Mr. STRAUSS. That is right.

Mr. FOGARTY. Or that they do not think that they could make any money on it as of now?

Mr. STRAUSS. None of these enterprises have been initiated by private industry, including those in which private industry is putting up all of the money, with any expectation they will be profitable. They are all recognized as uneconomic at this juncture. The differences between the insurance situation that we hope to achieve and the one that exists today is this: Today the Federal Government is fully liable, I assume, for any injury to third parties caused by any of the reactors in existence today, because the Federal Government owns them all.

Mr. FOGARTY. As long as they own them all?

Mr. STRAUSS. Yes; today they own them all. To the extent that reactors are built by private industry and they obtain $65 million of insurance from private insurance companies for which they pay premiums, the Federal Government is relieved of this amount of liability. Therefore, I regard it as a constructive step with the end in view of eventually having all the liability on the private insurance companies where it belongs. I do not think the Federal Government ought to continue to be an insuror for an indefinite period.

Mr. FOGARTY. I do not think so either, but I think insurance companies could probably do a much better job than they have offered at the present time.

Mr. STRAUSS. I will tell you why that is probably not so. It is because they don't know what the liability will be. All of the insurance companies have a finite capital. They do not know what the extent of the damage might be from a reactor catastrophe, nor can the Commission tell them.

Mr. FOGARTY. Now you have answered my question. You cannot tell them when anything is going to happen and cannot give them any ideas.

Chairman STRAUSS. Absolutely not.

Mr. FOGARTY. That is the answer that they are holding up the Government for at the present time. They seem to believe that the way you answer a question like that is to say that this could happen once or twice or three times in the first 3 or 4 plants that are built. You seem to indicate that there is a possibility of that happening.

Mr. STRAUSS. The Government today is not only carrying all the insurance on the plants it has, but if any other plants are built by the Government, the Government has 100 percent of the liability.

BUILDING OF ADDITIONAL ATOMIC PLANTS

Mr. FOGARTY. Do you expect any other plants to be built by the Federal Government?

Mr. STRAUSS. I do not want to anticipate whether the Gore bill will pass or not pass. The Gore bill would require the Commission to build 6 plants, 6 large plants at 6 different areas of the

country, and operate them. I presume operate them, because they would be plants which would not be profitably operated. They would lose money, and I presume therefor that the Government would have to operate them since no private individual would care to operate them.

Mr. FOGARTY. What are your recommendations along that line? Do you recommend that the Federal Government ought to build any more plants?

Mr. STRAUSS. I think the Federal Government should only build plants in the event we have a design for a reactor that we think should be built, and where private industry won't build it. Then I think we should do it.

Mr. FOGARTY. Are there any plans to that effect at the present time?

Mr. STRAUSS. No; we have no reactor as of the moment which we feel is ready to go into large scale construction that has not been contracted for or negotiated for by private industry.

Is that statement correct, Mr. Davis, or does it require modification?

Mr. DAVIS. It is absolutely correct.

Mr. FOGARTY. Do you anticipate any plans or anything new to come before you that would require construction by the Federal Government in the next year?

Mr. STRAUSS. That would take a degree of clairvoyance. I don't know what someone will think of, or what our laboratories will develop, but the policy of the Commission, if it continues as at present, would be that we would build it. We would ask the Congress for funds to build it if we could not get somebody else to do it and take the cost off the back of the taxpayers. In the Yankee contract we are only putting up $4 million. The rest of it is entirely being borne by the New England enterprises that are backing Yankee.

Dr. Libby asks me whether you are including reactors to produce plutonium. Those the Government built entirely. We have not asked private industry to build those.

Mr. FOGARTY. I was not thinking about those.

SHORTAGE OF SCIENTISTS

Now, I remember very well a year ago the discussion we had on the shortage of scientists in the country. I remember very well the statement you made, Dr. Libby, on this problem, and I think you either said at that committee meeting or I read it later on that you hoped that Members of Congress when they were home last year in talking before groups would bring this before the attention of the people.

Well, I have done that several times, but never received much response or much interest. I attempted to tell them that I thought that was the greatest field that they could get into at the present time, but I did not seem to get much response from the groups I talked to, or much enthusiasm for going to school and following this field.

Mr. LIBBY. We have had that same experience. I think we should still keep at it.

Mr. FOGARTY. The reason I mention it is that if we are all having the same experience, maybe we had better try something else.

Mr. LIBBY. As the chairman said this morning——

Mr. FOGARTY. Will you tell us in a few minutes now what you have done in the last year to increase the number of scientists in this country?

Mr. LIBBY. We have made it known that we need more. I think this is an important thing, the fact that Members of Congress and Government officials seem united on one thing, perhaps on more than one thing, but they seem united on this one. This is a serious problem and this is an important thing, to call it to their attention. I think we see signs of improvement in that. Perhaps a more critical problem from my point of view is the high-school teachers' salaries. This is one of the most difficult problems, but we do see the salaries being raised throughout the various communities in the country, and I think this will help. Before we can expect mathematics and science to be taught in the high schools, we will have to pay teachers salaries which will allow them to teach these subjects. I think we have made some headway. Of course, this is a slow thing.

The other thing is to interest the students that are through high school and are ready to head into other fields. We must get them interested in science. That I think we see some signs of turning in our favor here.

Mr. FOGARTY. What indications have you had that suggest a change?

Mr. LIBBY. Well, the fellowships that the National Science Foundation is thinking of offering are going to be increased. They could hardly do this without anticipating applicants for them. It may be nothing more than the upturn of the college population curve, but I think there is a percentage trend in our favor in this direction. I think the President's Committee is going to be very important——

Mr. FOGARTY. What committee is that?

Mr. LIBBY. The President appointed a Committee on Scientific Education and Manpower. President Bevis of Ohio State is chairman of it. It has a very distinguished membership. They have held one meeting so far. This Committee is to report to the President on ways to help on this problem.

Mr. FOGARTY. What was the name of that committee again?

Mr. LIBBY. It is the National Committee for the Development of Scientists and Engineers. President Bevis of Ohio State is the correct name.

Mr. STRAUSS. I would not like to wait for it to operate completely, and there is the law of supply and demand. If you open the New York Times, or any of the metropolitan papers on any Sunday, you see anywhere from 8 to 10 pages of display advertising of companies screaming for scientists and technicians. The salaries of these people have been very greatly increased in order to get them. A man with a doctor of philosophy degree goes into industry at a salary of ten to twelve thousand dollars a year. This fact, which quickly becomes known in the undergraduate community, and the secondary schools is as much of an incentive as almost anything I can think of to induce young people to go into the field. It has, however, also a bad effect in that it siphons teachers from the high schools into the various industries that bid for them. We do not know how to prevent that kind of piracy in a free country. It is one of the right that the people have to hire a man at the price they are willing to pay him, and he is willing to accept.

Mr. FOGARTY. Of course that problem exists in the field of medicine, too. It is a real problem there, although I don't think it is as much a problem as you have.

Mr. LIBBY. No; it is not.

Mr. FOGARTY. Now, the statement you made last year, Dr. Libby, to me, indicates that this is one of the most pressing problems you have, and I am kind of disappointed in what you have done about it. I don't think you have gone nearly far enough. I think that the things you are doing are not going to meet the problem at all. I think you have to get some new ideas. You said a while ago we are going to give $3 million to buy some of this expensive laboratory equipment for some of these schools. To me, $3 million in equipment is not anything. I would not brag about that, if I were you, that you are going to give or ask for $3 million this year to buy expensive laboratory equipment to help solve this problem.

Mr. STRAUSS. If we asked for 30 to 300 million dollars, it would sound like a more impressive amount, but we could not justify that.

Mr. FOGARTY. Maybe you could not justify that particular item. Maybe you should not get the $3 million. Maybe you can't justify that, I don't know. But I do know or it sounds to me that this is a really serious problem and from what you have told me so far you are not doing much about it, or have not done much about it. The accomplishments in the past year have not been much.

Mr. STRAUSS. Let me reply to you by saying that there is nothing in the law that requires the Atomic Energy Commission to do anything in the educational field. This is a responsibility that you have just as much as I have; more so.

Mr. FOGARTY. As the chairman said a while ago, it is a responsibility you and I must share. As long as you hold the job of chairman of this Commission, you will make certain recommendations to the Congress, and hope that they will be followed out. When the Congress refuses to grant you appropriations for what you think you need, then I think you ought to criticize Congress for it. But when you appear before this committee and don't come up with recommendations that I think you should have presented in your position as Chairman of this Commission, I think we have some right to find fault with you. Do you think I am wrong?

Mr. STRAUSS. Yes; for this reason. If I thought the mere appropriation of money by this committee could make more scientists, I would come to you and ask you for an appropriation for that purpose. I don't believe that that is the way they are to be made, and that is the reason we don't come to you and ask you for it.

PROPOSAL FOR LEGISLATION

Mr. FOGARTY. It is not a question of appropriating funds. I think that perhaps there might have been some legislation that you could have proposed that would have put more scientists in the field. Now you know that we have a shortage of nurses in this country. There is a shortage of nurses in every city and town in the country. The Congress or the Department of Health, Education, and Welfare have finally recommended legislation that will do something about getting more practical nurses and trained nurses into the field of medicine.

Now, that is an example of concrete action taken by that branch of the Government and the Congress. That bill just passed the Senate a couple of days ago. Now, that is one example of what we are trying to do. We know, too, in the field of medicine that there is a shortage of equipment and laboratories and laboratory space, so the Department again has recommended to the Congress that they do something about providing additional space and money for equipment and laboratories to provide this scientific equipment for research in the field of medicine.

Now, the Department of Health, Education, and Welfare have made those recommendations to the Congress, and the Congress is doing something about it, and I think that is going to help alleviate that particular problem. In the past, there has been a tremendous shortage of psychiatrists in this country, and because of the recommendations of the Department of Health, Education, and Welfare, we have, by giving training grants to medical schools over the past 8 or 9 or 10 years, increased the number of psychiatrists immeasurably in this country in the past 10 years.

Now, those are some examples I know something about, and that is why I think you have been derelict in your duty in not proposing something to the Congress that could in some way produce more scientists or keep more scientists in this particular field.

Mr. STRAUSS. I will accept the charge of lack of imagination because I can't refute it. I think you were here this morning when, in reply to the chairman's question, I told him of the two recommendations I had made, neither of them to the Congress. One of them to the scientific and engineering societies of the country, the other to the officers of the American Association of Colleges, the American Association of Universities and Land Grant Colleges, and the third, the name of which escapes me.

I had no authority to make those recommendations. They were made in my capacity as a private citizen. They were directed to the suggestion that those colleges stiffen their entrance requirements in order that students could matriculate, could come in only with a certain number of credits in sciences and mathematics. It is conceivable that at their annual meeting this year, steps will be taken along those lines, but I don't know that there is anything that Congress can do to compel that.

Mr. FOGARTY. I don't know whether there is or not. As I say, I am not an educator, and I am not an expert in this field, but it seems to me you might come forth with some recommendations that grants be given to some of these scientific schools and that training grants be allowed and scholarships, Federal scholarships of some kind be granted to these people graduating from high school. I think there is a big field here where the Federal Government could help in aiding these people to become scientists, in helping some of these schools at the present time to expand the facilities they have.

Mr. STRAUSS. The scholarships are not wanting. The scholarships are there in plenty. It is the students who are wanting. There are scholarships that are unfilled.

Mr. FOGARTY. If that is so, then maybe there should be some program of training teachers.

Mr. STRAUSS. There you may have something.

Mr. FOGARTY. An expanded training program in teaching could be sponsored by the Federal Government or these schools could help in

advanced training of some sort. Let them go into the high schools and try to convince these young boys of the need and the possibility of advancement in this field. It is a new field and I think something can be developed. I am surprised that you people have not come forward with something, even though it might be called aid to education.

Mr. STRAUSS. It is encouraging to see the extent of your interest. I would like to get together with you later on.

Mr. FOGARTY. I am not going to find fault with you, but I would like to see something done about it. Now, 4 or 5 years ago we started appropriating funds or granting funds for teaching in all of the medical schools in this country for heart, cancer, and mental health. Now we have not had one complaint on that program as an aid to medical schools, although when a bill was proposed for aid to medical schools, it was defeated. But the American Medical Association and everyone concerned with this program has said it has been one of the best working programs in the field at the present time.

Mr. STRAUSS. Have you increased the number of medical students?

Mr. FOGARTY. Yes; we have. It is very small. The only way we are going to increase the number of medical students is to have more medical schools and the only way we are going to help them is to build more facilities, and the only way we are going to help do that is through Federal assistance because they are running in the hole every year. I am for that assistance. I don't think there is any interference by the Federal Government in any program like that because the only thing we demand of the funds that we appropriate is that they be expended for that purpose and that is all. We have had no complaints. That goes for all the training grants. We are spending in the neighborhood of $30 million this year in training grants for these medical schools in this country. I think this is one of the best programs we have going and I think you could come up with some program similar to that or along that line and accomplish more than you are at present.

Mr. STRAUSS. We will accept the challenge.

Mr. FOGARTY. All right, that is a challenge. Now, did I understand you correctly to say that there was not a distinguished or qualified physicist in all Spain?

Mr. STRAUSS. No; I don't think I said exactly that, sir. I meant there were none that I could think of at the moment. I was listing people in other countries.

Mr. FOGARTY. I thought you said in all these other countries with the exception of Spain.

Mr. STRAUSS. What I said may have been susceptible of that interpretation. I simply cannot think of the name of any distinguished Spanish physicist. I am satisfied there must be many.

Mr. FOGARTY. There is another thing on which I did not want any misunderstanding. I don't know what the question was that was asked of you, but I thought you looked with disfavor upon some of the relief that we had sent to Europe in that we were telling the people over there that it came from America.

Mr. STRAUSS. I think you got the contrary point of view. I said I was associated with a relief enterprise for a time, the proudest experience of my career, and that we took good care to mark every shipment and every bag of it as a gift of the American people.

Mr. FOGARTY. I misunderstood; I am sorry.

Mr. STRAUSS. I am glad you mentioned it.

Mr. FOGARTY. I made 2 or 3 trips over there and each congressional committee I came back with made the strong recommendation that all of these goods be labeled. We found fault that many of them were not labeled, and that Russia was doing a much better job than we were in advertising what little they were giving to these countries.

Mr. STRAUSS. I had this experience when you were very young, from 1914 to 1921.

Mr. FOGARTY. I was 1 year old in 1914. But I am talking about this last World War in Russia.

ADVANCES IN MEDICAL FIELD

Now, what advances in the medical field have we made in the past year, especially in the field of cancer?

Mr. STRAUSS. I am going to ask Dr. Dunham, the Director of the Division of Biology and Medicine, if he can make a reply to that question.

Dr. DUNHAM. I don't think there have been any spectacular advances. There has been no instance of a specific kind of cancer for which we now have a cure. On the other hand, the use of radiocobalt in treatment of cancer is spread now so that there are about 70 of these units around the country working practically around the clock in many institutions treating cancer. We have under our program by the use of radioisotopes discovered some very interesting things about the requirements of cancer cells for their existence. There are certain building blocks that are needed in all cells. It has been found by some work we supported at the Sloane-Kettering Foundation that certain cancer cells require these in tremendous quantity compared to a normal cell. This fact gives us the possibility that, by depriving an organism of these particular building blocks, interfering with their metabolism in the cells, we may be able to attack the cancer problem.

In addition, there have been some interesting studies on the chemology of the cancer cells. That is the development by the cancer cells of specific antibodies to these cancer cells which circulate in the bloodstream similar to the type of antibodies which are produced by bacteria when they invade the body. By using cancer cells to inject into an experimental animal and just in the way they used to produce antitoxin for diphtheria, we can produce a tremendous abundance of these antibodies and by tracing these with radioiodine and narrowing them down to antibodies which are specific only for those particular cells. It looks as though there again was a possible approach to treating cancer.

This work has only been done experimentally. We have been able to put enough radioactivity into these antibodies so that they injure the cancer cells, but we have not yet been able to put enough in so as to kill them. But again it is a pioneer effort. It is a step along with other things, chemical approach and so on, toward attacking the cancer problem.

Mr. FOGARTY. So you are making some progress.

Dr. DUNHAM. Very definitely.

Mr. FOGARTY. Now, there is one question I would like to ask you. I had dinner last night with a man who is considered to be one of the

most outstanding men in the field of leukemia, Dr. Sidney Farber. He seemed to think that some of the symptoms of leukemia were similar to those of some of these people that died in Japan at the dropping of the bomb in Nagasaki and Hiroshima, because of the massive bleedings which caused their death. Massive bleeding also causes death in these children, because of this miserable disease that they are suffering under.

What, if anything, has been done to try to find out if there is any similarity or any connection at all between the two?

Dr. DUNHAM. The evidence to date is that the mechanism of bleeding is to all intents and purposes identical. Whether it is in a patient with leukemia as a result of either leukemia or the chemotherapeutic agent that has been used, this mechanism damages the bone marrow and interferes with the blood platelets, which are responsible primarily for blood clotting. We have supported work in Dr. Farber's institution which is very exciting to us, because it appears now that they are on the brink of isolating or concentrating from a mass of platelets the substance that can be preserved in the refrigerator and then be used later in place of platelets either to treat these people with leukemia who are hemorrhaging, or patients who might have suffered a severe radiation injury, whether in warfare or in accident from a reactor, or something of that sort. This is very exciting work and they have treated some 100 children now in that particular hospital for hemorrhage. It appears that these preparations that Dr. Klein is getting out are effective.

Mr. FOGARTY. But you have never come to any conclusion or anything that where the platelets have been destroyed by some cancerous agent or radiation, there is no connection at all?

Dr. DUNHAM. The mechanism of destruction is different. The radiation damages the cells which make platelets. The leukemia crowds out the cells that make the platelets.

Mr. FOGARTY. Doctor, did you have a ceiling on funds this year given to you to ask for in biology and medicine?

Dr. DUNHAM. I think this figure you have in your budget is very similar to the one which we submitted a year ago.

Mr. FOGARTY. I mean were you given a ceiling by the Commission and told that you could have up to so much money for biology?

Dr. DUNHAM. There was no arbitrary ceiling. This was based on our estimate of last summer.

Mr. FOGARTY. You got exactly what you asked the Bureau of the Budget for?

Dr. DUNHAM. Yes.

Mr. FOGARTY. You are spending just as much money as you can in this field?

Mr. FIELDS. He did not say that.

Mr. FOGARTY. Let me say that. In another way. How much would you say you can effectively spend in your work?

Dr. DUNHAM. Not very much more.

Mr. FOGARTY. How much?

Dr. DUNHAM. With the press of developments in the weapons testing field in the Pacific from the standpoint of tracing radioactive fallout in the ocean and in the stratosphere, and that sort of thing, I think we could use perhaps another million dollars. In the medical field, we are very careful not to overlap with the activities of HEW.

Mr. FOGARTY. I understand that the cooperation between you and the American Cancer Society and the National Institutes of Health is good. You all work together so that you are not giving grants to the same grantee. That avoids duplication as far as these Federal funds are concerned. Is that correct?

Dr. DUNHAM. That is correct.

GRANTS

Mr. FOGARTY. Now, will you supply for the record a list of all the grants that you are supporting this year, and a little explanation of what they are, the schools and the institutions?

Dr. DUNHAM. Yes, sir.

(The following information was subsequently supplied:)

FISCAL YEAR 1957 ESTIMATES, DIVISION OF BIOLOGY AND MEDICINE

Compilation of university research contract program by State, institution, and title

Institution	Project title	Estimated amount
ALABAMA		
Biology:		
Alabama Polytechnic Institute.	Utilization of radioactive tracer techniques in investigations of the feeding habits of non-gall-forming, plant parasitic nematodes.	$3,000
Do	Radioisotope studies on amino acid imbalances and other factors affecting metabolism of amino acids in micro-organisms and animals.	7,900
Southern Research Institute.	Body retention of carbon-14	9,200
Do	Use of radioactive isotopes in a study of the site of inhibition of polynucleotide synthesis in cells following exposure to X-radiation.	6,800
ARIZONA		
Biology:		
Arizona, University of	Utilization of phosphorus from biological material and uptake of strontium by various type crops.	5,133
Do	The synthesis of fatty acids in higher plants	3,910
ARKANSAS		
Medicine:		
Arkansas, University of	Biochemical and nutritional aspects of X-radiation injury	5,000
Do	To investigate, develop, and evaluate radioistopes for teletherapy.	10,000
Biology:		
Arkansas, University of	Developmental-genetic study of the effects of X-ray irradiation in *Drosophila virilis* and *Bufo valliceps*.	4,200
Do	The utilization of radioistopes by vertebrate embryos	7,000
Do	Studies on the phosphorylation cycle in the intact animal using radioactive phosphorus.	13,200
CALIFORNIA		
Medicine:		
California, University of	Studies on induction of thyroid cancer and on the nature of metabolic blocks following irradiation.	25,000
Do	Carbohydrate metabolism as studied with C-14 labeled compounds.	23,000
Do	Growth-promoting agents in adult tissues	10,000
Cedars of Lebanon Hospital.	Chemical studies on connective tissues of animals aged prematurely by irradiation (assessment of biochemical age).	12,000
Do	To investigate, develop, and evaluate radioisotopes for teletherapy.	10,000
Children's Hospital Society of Los Angeles.	Iron storage and reutilization	12,000
Southern California, University of.	Intracavitary application of beta sources	9,955
Do	The mechanism of ion secretion	10,000
Stanford University	Biological and medical investigations with the 70-million-electron-volt linear electron accelerator.	40,000
Biology:		
California Institute of Technology.	Genetic and cytological effects of high energy radiation	43,000
Do	Biological synthesis of protein with use of isotopes	12,300

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
CALIFORNIA—continued		
Biology—Continued		
California, University of	Effect of radiation on work capacity and longevity of the dog	$82,050
Do	Tracer and enzymatic studies on metabolism of plants and bacteria.	19,900
Do	Use of radioactive isotopes and other indicators to study absorption and distribution of herbicidal chemicals in plants.	10,000
Do	Mechanism of biosynthesis of polycyclic compounds	13,000
Do	Distribution studies of the reticuloendothelial system at various stages of development in relation to the problem of the dissociation of liver functions.	6,100
Do	Intermediary metabolism of organic compounds and biological synthesis in farm animals.	35,000
Do	Study of ion absorption in plants	9,500
Do	Investigation of the mechanism of the effect of ultraviolet light on enzymes and viruses.	5,582
Do	Study of the decontamination of soils containing radioactive elements and salts.	14,500
Do	Radiosensitivity of the hen's oviduct	7,000
Do	Study of plant virus via study of normal plant proteins	14,070
City of Hope Medical Center.	A. The effect upon the mutation rate of removal at time of irradiation of peroxides from irradiated germ cells; B. A comparison of patterns of free amino acids and other metabolites in several minute stocks of *Drosophila melanogaster* at various stages of development and the influence of X-irradiation upon these patterns.	8,600
Southern California, University of.	Effect of radiation on intestinal absorption and metabolism of fats and carbohydrates.	26,840
Do	Study of the effects of X-radiation on the absorption of glycerides utilizing tracer techniques.	4,700
Western Biological Laboratories.	Further studies of an unidentified factor in liver which prolongs survival of animals administered multiple sublethal doses of X-irradiation.	6,600
COLORADO		
Medicine:		
Colorado, University of	Study of the abnormal physiology of immune reactions	11,000
Do	A study of the combined action of certain chemical inhibitors of metabolism with X-radiation and other ionizing radiations on the growth of certain transplantable malignant tumors.	13,000
Biology:		
Colorado, Agricultural and Mechanical College.	The potential productivity and energy budgets of high mountain lakes in north central Colorado.	12,000
Colorado, University of	Ecology of selected stands on the east slope of the front range in Colorado.	25,000
CONNECTICUT		
Medicine:		
Yale University School of Medicine.	Phosphorylation mechanisms in nucleic acid synthesis in hematopoietic tissue.	6,000
Yale University	The formation and utilization of the saturated and "essential" fatty acids in the biosynthesis of various lipids in man.	8,500
Biology:		
Connecticut Agricultural Experiment Station.	Therapy of plant disease by nuclear radiations	3,700
Connecticut, University of	Study of alkaloidal synthesis in Claviceps purpurea	4,800
Wesleyan University	Respiratory pathways in fungi and actinomycetes	8,500
Yale University	Relationship of genes to biochemical reactions in neurospora	21,200
Do	Investigations on the cytogenetic effects of radiations	18,000
Do	Radiation effects on mammalian chromosomes in tissue cultures	16,000
Do	Irradiation of viruses and large molecules	21,000
DELAWARE		
Biology:		
Delaware, University of	The relation of genome number to radiosensitivity in habrobracon.	11,000
FLORIDA		
Medicine:		
Howard Hughes Medical Institute.	The influence of certain diets, vitamins, and hormones upon the synthesis of cholesterol, mucopolysaccharides, and protein of connective tissue.	12,000
Miami, University of	Effects of radiation on animal blood capillaries	10,500
Miami, University of, School of Medicine.	A study of factors affecting the selective uptake and retention of ZN-65 by the dorsolateral prostate of the rat, and a study to the role of zinc in the physiology of the prostate.	11,000
Yerkes Laboratory of Primate Biology, Inc.	Behavioral effects of ionizing radiation on chimpanzees of various ages.	19,335

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
FLORIDA—continued		
Biology:		
Florida, University of	Concentration of mineral elements in the fetus and relationship to placental transfer of these elements.	$16,740
Do	Recovery of radiation induced micromutations in oats by recurrent selections.	5,200
GEORGIA		
Medicine:		
Emory University	To investigate and evaluate radioisotopes for teletherapy	10,000
Do	Effect of radiation on learned behavior, problem-solving ability and neutral mechanisms of rhesus monkeys.	11,000
Georgia, Medical College of.	Effects of nutritional deficiencies on the synthesis of Phospholipids and nucleoproteins in the rat.	8,000
Do	Investigation of the results of treating crippling emphysema with I-131.	3,000
Biophysics:		
Emory University	Biological studies on the distribution of radioactive metals with special reference to damaging levels of tissue concentration.	17,000
Biology:		
Emory University	Study of influence of oxygen level and temperature on effects of ionizing radiation.	6,700
Georgia, University of	A study of the ecological change on the AEC Savannah area through the use of indices for total community function and measurements of the biomass of key populations.	18,400
IDAHO		
Biophysics:		
Idaho State College	Development of analytical methods for the determination of small amounts of strontium, uranium, and fluoride.	10,260
ILLINOIS		
Medicine:		
Chicago Medical School	Study, latent tumor cells as produced by beta radiation and comparison of latent tumor state with that produced by chemical carcinogens.	$10,000
Chicago, University of	Radiosensitivity of the lymphocytes	8,000
Do	Bacteriological aspects of radiation sickness	45,000
Do	Effect on gastric tissues of irradiation therapy in peptic ulcer	12,000
Do	The physiological factors involved in antibody synthesis and in the modification of the immune process by X-irradiation.	35,000
Do	Studies on mechanism of action of ionizing radiations	23,828
Do	Investigate mechanism of antibody synthesis by tracer technique	7,000
Do	The effect of whole body ionizing radiation on tuberculin hypersensitivity.	10,000
Illinois, University of	Experimental research on synthesis of boron-containing dyes	12,000
Do	Reevaluation of radiation injury (B rays) of the skin by a direct method approach.	17,000
Illinois, University of, College of Medicine.	Study on the effects of intragastric irradiation with beta rays from ruthenium-106—rhodium-106 in patients with malignant disease.	6,000
Northwestern University	The effects of irradiation on renal transport systems	9,800
Do	Synthesis and metabolic studies of rings A and/or B labeled estradiol and related compounds.	13,000
Rheumatic Fever Research Institute.	Metabolism of biologically active amines	20,000
Biophysics:		
Armour Research Foundation of the Illinois Institute of Technology.	Efficiency of scavenging devices used in determining fallout	25,000
Chicago, University of	Proton and ultraviolet microbeam	39,900
St. Procopius College	Ionization of gasses	24,000
Rheumatic Fever Research Institute.	The separation and characterization as regards radiation sensitivity of the proteins of lymphoid tissue.	15,000
Biology:		
American Meat Institute Foundation.	Relation of vitamin B_{12} to nucleic acid metabolism	8,000
Chicago, University of	The genetic functioning of heterochromatin	
Do	Effect of blue and dark red light upon reactivation of ultraviolet treated photosynthetic microorganisms.	9,500
Do	Biosynthesis of radioactive drug compounds	16,055
Do	The entropy of amino acids and proteins	15,000
Do	Studies in photobiochemistry and bioenergetic problems	8,937
Illinois, University of	Intermediary metabolism of carbohydrates	8,700
Do	Utilization of carbon-14 in studies of metabolism of lactose	10,000
Do	Nutritional biochemistry on metabolism of vitamins, amino acids.	8,000
Do	Metabolism of amino acids labeled with radioactive carbon	4,000
Northwestern University	The effects of radiation on pure proteins and nucleic acids	13,000

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
ILLINOIS—continued		
Biology—Continued		
Southern Illinois University.	The effects of X-rays and ultraviolet radiation on the multiple manifestations of a gene together with genetical analysis of the radiation induced variations and the effects of extracts from unirradiated cells on the repair of the genotypes of irradiated cells.	$10,000
INDIANA		
Biology:		
Indiana University Foundation.	Biosynthesis and specificity of normal and immune proteins	7,000
Do	Influence of radiation in altering incidence of mutations in drosophila.	22,500
Do	Energy transport in bacterial cell-free extracts	6,000
Do	Cellular heredity in paramecium	15,000
Notre Dame, University of	Mechanism involved in the actions of radiations on living cells	14,000
Purdue Research Foundation.	Carbohydrate catabolism in plants	6,500
Do	Genetic effects of thermal neutron irradiation in homozygous tomatoes.	4,500
Do	Use of radioactive isotopes in studying mold metabolism with emphasis on the assimilatory mechanisms of pencillium chrysogenum and other representative molds.	6,500
Do	Physiology of hydrogen bacteria	6,400
IOWA		
Medicine:		
Iowa State College	Comparative toxicity of rare earth compounds	10,800
Iowa, State University of	Quantitative and morphologic study of radiation induced cataracts.	17,000
Do	Radioiodine studies of fetal and other thyroids	8,000
Iowa State College	Synthesis of organic compounds	23,900
Biology:		
Iowa State College of Agriculture and Mechanic Arts.	Plant biochemistry of boron	4,000
Iowa State College	Mode of action study of radioisotope-labeled organic insecticides with emphasis on problems of insecticide resistance.	9,000
Do	Study of lifetime sickness and mortality and progeny effects resulting from exposure of animals to penetrating irradiation.	95,865
KANSAS		
Medical:		
Kansas, University of	Biochemical studies into the in vivo effects of radiation on mammalian nucleic acids.	8,000
Do	Investigation of organic substances tagged with I–131 by human thyroid gland in vivo.	10,000
Biophysics:		
Kansas, University of	Study of deposition and excretion of bone-seeking radioisotopes	19,000
Biology:		
Kansas State College	Phosphoproteins of the embryonated egg	4,300
Do	Mode of action of anthelmintics. I. Carbon disulfide	6,800
Do	Use of radioactive tracers in investigations of the mode of action of insecticides with emphasis on potential systematic or chemotherapeutic action.	8,300
KENTUCKY		
Biology:		
Morehead State College	Germination and seedling growth of irradiated seeds of several dominant species of the United States deciduous forest region.	7,500
LOUISIANA		
Biology:		
Louisiana State University.	Investigations of the toxin theory of plant disease using labeled plant pathogens.	6,800
MAINE		
Biology:		
Roscoe B. Jackson Memorial Laboratory.	Study of endemic and epidemic diseases in mice	19,900
Do	Physiological studies on induced congenital deformities in mice	12,000
Do	Attempt to delineate inborn anemias in mice	20,000

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
MARYLAND		
Medicine:		
John Hopkins University	Mechanism of bone deposition and related physiological studies	$23,000
Do	Mechanism of the activation of latent epidemic typhus infections in animals and humans by cortisone and X-ray.	18,000
Do	Absorption, utilization and excretion of vitamin B-12; blood coagulation, hemorrhagic disease.	11,000
Do	A study of metabolism and active transport of certain divalent metals in tissues and in isolated mitochondria, with special attention to the possible role of complexing agents in these processes.	2,500
Biology:		
Johns Hopkins University	Cell membrane permeability and accumulation of ions	15,693
Do	Purification of intrinsic factor in gastric juice	7,000
Do	Study of relative diffusion rates of isotopes from capillaries	7,000
Do	The action of radiation and other mutagenic agents (1) in inducing mutation in drosophila females, and (2) in controlling the actions of a specific gene responsible for suppressing uncontrolled growth.	13,000
Do	The effects of ionizing radiations on gene and chromosome mutation rates in normal human cells in tissue culture.	22,000
Do	(*a*) Transformation of E coli B from virus sensitive to virus resistant, or vice versa, (*b*) chemical and nutritional studies of bacterial viruses.	11,068
Do	Biochemical changes resulting from mutations induced by X-rays, ultraviolet, and nitrogen mustard.	11,500
Do	Modification by supplementary agents of the rates of induced chromosome and gene changes.	7,700
Do	Factors influencing the metabolism of copper and iron	8,700
Maryland, University of	Studies on the physiology and the nutrition of lactating ruminants.	10,800
MASSACHUSETTS		
Medicine:		
Beth Israel Hospital	The use of I-131 in treatment of heart disease and followup studies on biological effects of radiation.	16,000
Boston University	Effects of irradiation on transplanted or regenerated adrenocortical tissue in the rat.	13,000
Boston University, School of Medicine.	Enzymology of the formed elements of human blood. Dynamics and biosynthesis of carbon labeled substrates by human leucocytes in vitro.	10,000
Do	Radiation-induced changes in nucleic acids and their hydrolysis products.	6,000
The Children's Medical Center, Boston.	Study of hypoplastic and aplastic inborn anemias in humans	23,000
Do	Nature of bleeding in pancytopenia with special regard for thrombocytopenia and the vascular defect.	55,000
Do	Effect of irradiation on induction of pituitary tumors	15,000
Harvard University Medical School.	The effect of ionizing radiations on peripheral nerve	9,000
Harvard University	Use of isotopic tracers in studies on the nature of cellular membrane and the passage of substances through it; use of isotopes in metabolic studies; the development of isotopic techniques applicable to problems in biology and medicine.	65,000
Do	Factors affecting metabolic pathways	15,000
Do	Radiation effects on the lung	13,500
Do	The use of radioactive isotopes in the study of protein synthesis	20,000
Massachusetts Eye and Ear Infirmary.	Study of the healing of corneal wounds, with special reference to the plastic artificial cornea.	20,000
Do	Study of the metabolism of the ocular lens with the use of radioactive compounds.	13,000
Massachusetts General Hospital.	Effects of radioactive iodine on biology of thyroid gland	15,000
Do	Establishment of beryllium case registry	10,000
Do	Use of thermal and epithermal neutrons in treatment of neoplasms.	45,000
Do	Metabolism of calcium and strontium as disclosed by tracer studies on patients with thyroid and related diseases.	20,000
Do	External localization of brain tumors employing positron emitting isotopes.	36,000
Do	Biochemical study of effects of radiation on cells	55,000
Massachusetts Memorial Hospitals.	Physiological and therapeutic investigations and fundamental blood studies using radioactive isotopes.	27,000
New England Deaconess Hospital.	Acute and chronic radiation injury	205,000
Do	The effects of ionizing radiation on the developing mammalian nervous system.	14,000
New England Center Hospital.	Physiopathology of platelets and development of platelet substitutes.	25,000

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
MASSACHUSETTS—continued		
Medicine—Continued		
Peter Bent Brigham Hospital.	Intracellular changes in trauma, depletion and repair	$37,500
Retina Foundation	A comparison of the fine structure of the normal and the irradiated lens.	10,000
Tufts College	Study of effects of radiation on growth	30,000
Do	Enzyme studies on white blood cells and blood platelets	8,000
Tufts College Medical School.	Investigation of enzymic, biochemical and other cytological activities of human leukocytes.	18,000
Worcester Foundation for Experimental Biology.	Investigation of effects of radiation on biosynthesis and metabolism of adrenocortical steroids.	65,000
Biophysics:		
Massachusetts Institute of Technology.	Radium and mesothorium poisoning, and dosimetry and instrumentation techniques in applied radioactivity.	100,000
Woods Hole Oceanographic Institute.	Studies on the background radiation and flow of deep ocean currents.	50,000
Biology:		
Amherst College	Studies on nucleic acid and free nucleotide synthesis in normal tissue and tumor tissue using C-14.	13,128
Do	Genetic effects of acute and chronic low level irradiation with cobalt 60.	18,400
Harvard University Bussey Institute.	The biological effect of radiation; effects of irradiation on chromosomes.	7,400
Marine Biological Laboratory.	Studies on the physiology of marine organisms using radioisotopes.	10,000
Massachusetts Institute of Technology.	Fundamental studies on the effects of ionizing radiations on bacteria.	13,000
Woods Hole Oceanographic Institution.	Biological and chemical studies of coastal plankton populations	52,000
Worcester Foundation for Experimental Biology.	Effects of Co-60 irradiation on rabbit eggs in vitro	9,500
MICHIGAN		
Medicine:		
Kresge Eye Institute	Effects of neutrons and other radiations on the ocular lens	18,000
Michigan, University of	Clinical evaluation of teletherapy	60,000
Do	Immunological study of tumors	60,000
Do	The biological effects of radiation	50,000
Do	Studies with an X-ray monochromator and X-ray irradiation service operation.	20,000
Do	Effects of radiation on the intermediary metabolism of mammalian skin.	9,000
Parke, Davis & Co	Factors elaborated by animal tissue which stimulate rate of regeneration of hematopoietic organs of animal exposed to total body irradiation with gamma rays.	60,000
Wayne University College of Medicine.	Evaluation of radioactive isotope gamma ray source for medical teletherapy.	10,000
Biophysics:		
Michigan, University of	High resolution detection of nuclear radiations	15,500
Biology:		
Central Michigan College of Education	A proposed key for the classification of the immature forms of tendipedidae (chironomidae: deptera).	8,500
Michigan State University.	The role of various aliphatic acids in pyrimidine biosynthesis	6,000
Do	The effects of irradiation on developing plant embryos	7,000
Do	(I) Absorption and utilization of radioactive minerals applied to leaves of plants; (II) absorption and utilization of ruthenium by plants; (III) leaching from leaves of plants.	25,000
Michigan, University of	The effect of irradiation on genetically heterogeneous populations of the deer mouse, *Peromyscus maniculatus*.	25,000
Do	Development of information concerning (1) human mutation rates; (2) the accumulation of deleterious recessive genes in human populations; and (3) the manner of action of selective factors on both contemporary and primitive human populations.	85,000
MINNESOTA		
Medicine:		
Minnesota, University of	Effect of ionizing radiations upon tissue metabolism	20,000
Do	Study of mechanisms of radioactive isotopic localization in tissues of the central nervous system.	12,000
Do	Studies on the relationships of porphyrins, tumors and X-rays	30,000
Biophysics:		
General Mills, Inc	Texas balloon flight operation	50,000

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
MINNESOTA—continued		
Biology:		
Minnesota, University of	Study of enzymic phosphorylation reactions with O^{18} and P^{32}	$10,300
Do	The genetic basis and practical significance of mutations induced in oats and barley with ionizing radiations.	11,700
Do	Studies in lipid metabolism by means of radioactive tracers	7,950
Do	Effects of radioactive substances on plant pathogens and other microorganisms.	28,000
Do	The cause and nature of an aplastic anemia of the bovine	21,000
MISSISSIPPI		
Biology: Mississippi, University of.	Chromosome breakage in oocytes of *Drosophila*	10,000
MISSOURI		
Medicine:		
St. Louis University, School of Medicine.	Relation of rickettsial and viral infections to radiation injury	17,500
Washington University	Synthesis of nucleotides and related compounds	18,000
Do	Relationship between radiation damage and the immune state	3,000
Biology:		
Missouri, University of	Determination of thyroid activity in farm animals by the use of radioactive tracers.	17,200
Do	Study of the inheritance of productive processes in domestic animals by endocrine methods using radioactive isotopes as tracers.	17,500
NEBRASKA		
Biology:		
Nebraska, University of	Evaluation of effects of radiations on quantitative characters in corn, soybeans, and other crops as related to breeding improved varieties: I—Corn research: II—Soybean research.	8,000
Do	Effects of X-rays and thermal neutrons on plant metabolism	8,500
NEVADA		
Biology:		
Nevada, University of	Range livestock production adjacent to Nevada Proving Grounds.	20,000
NEW JERSEY		
Biophysics:		
Isotopes, Incorporated	Radiostrontium analysis	35,000
Biology:		
Rutgers University	Histological and physiological effects of irradiation on plant tissues.	8,000
NEW MEXICO		
Medicine:		
Lovelace Foundation	Indirect blast injuries	75,000
NEW YORK		
Medicine:		
Albert Einstein College of Medicine of Yeshiva University.	The metabolism of adenosine triphosphate and related compounds in the erythrocyte.	10,000
Columbia University	Turnover of specific proteins, protein fractions and nucleic acids in normal and malignant human testis and kidney.	20,000
Do	Effect of exposure to radioactive materials and X-ray irradiation on nerve tissue.	10,000
Health Research, Inc., Simon Baruch Laboratories.	Intracellular distribution and enzymatic function of cobalt	8,000
Health Research, Inc., Roswell Park Memorial Institute.	The role of serum erythropoietic factor in the anemia of malignancy.	7,000
Do	The localization of physiologically active amounts of radioactivity in human tumors by means of radioactive antibodies.	13,000
Montefiore Hospital	Study of the distribution and excretion of lanthanum and the rare earth elements.	25,000
Do	Dynamics of strontium distribution in the body	15,000
Rochester, University of	Metabolism of bone sodium	15,000
Do	Individual response to ionizing radiation in animals and patients	40,000
Sloan Kettering Institute for Cancer Research.	Biological effects of radiation and related biochemical and physical studies.	250,000

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
NEW YORK—continued		
Medicine—Continued		
St. Lukes Hospital	The life span and behavior of mammalian platelets in vitro and in vivo using chromium 51 tag.	$16,000
New York, State University of, Upstate Medical Center.	Changes in protein-bound sulfhydryl in renal cells under varying experimental conditions.	12,000
New York, State University of, Research Foundation.	The metabolism of radioactive thyroid hormones in tumor-bearing animals and tumor tissue.	12,000
Do	Transfusion of bone marrow into rabbits after total body irradiation.	6,000
New York, State University of, Research Foundation College of Medicine.	Effects of irradiation on the calcifying mechanisms of epiphyseal cartilege.	7,500
New York University, Bellevue Medical Center.	Immunochemical studies on beryllium	12,000
Do	Tissue reactions to intrapulmonary radiation	12,000
New York University	Determination of the variable concentrations of trace elements in human tissue and body fluids.	20,500
Do	Aerosol retention studies	20,000
Do	The transfer of cellular antibodies in relation to the immunological aspects of the homograft rejection reaction.	20,000
Do	The distribution and persistence of radioactive aerosols in the lungs of animals.	18,000
Do	1. The effect of the degree and duration of refrigeration on human and animal skin; 2. The search for antibodies produced by the application of skin homografts in animals and man.	15,000
Biophysics:		
Columbia University	Attenuation of scattered cobalt-60 radiation in lead and building materials.	8,000
Do	Filtration of monodisperse radioactive solid aerosols (dusts)	16,000
Do	Biological action of ionizing radiation; instrumentation for research.	200,000
Columbia University, Lamont Geological Observatory.	Distribution of certain fission product activities	67,800
Do	Studies of circulation of the deeper oceanic water	50,364
Sloan Kettering Institute for Cancer Research.	Equivalence of absorbed radiation energy and cavity ionization	13,000
Biology:		
Columbia University	Study of the action of radiation on deoxypentose nucleic acids having biological (transforming) activity.	7,900
Do	Pathways of alkaloid biosynthesis	15,000
Do	Population genetics of species of drosophila	10,326
Do	Studies of mutations in populations of wild house mice	15,000
Do	To identify precursors and end-products containing radiocarbon, in studies of the role of glucose, ascorbic acid, etc., in metabolism.	3,000
Do	The activation of hydrogen by viological catalysts	16,140
Do	Nucleic acid and protein synthesis in individual cells and chromosomes studied by radioactive tracers and autoradiographs.	12,000
Cornell University, New York Agricultural Experiment Station.	The induction and testing of somatic mutations in apples, grapes, and other economic plants.	3,500
Fordham University	Fate of thiamine and thiamine analogs in the animal body. Mechanism of thiamine inhibition by thiamine analogs.	5,500
Do	Hydrolysis and enzymatic degradation of proteins	10,300
Long Island Biological Association.	The study of spontaneous and induced genetic changes in mammalian cells grown in tissue cultures.	17,400
Do	Adaptive value of experimental populations exposed to radiations.	38,500
New York Medical College.	Factors influencing the solubility of heavy metal compounds and their metabolism.	5,000
Do	Histochemical studies of metabolic alterations in rats receiving lethal and sublethal doses of radiation, with emphasis on terminal vascular bed.	10,000
Rochester General Hospital.	Study of the uptake, turnover, and metabolism of the chemical constituents of bone.	2,500
Syracuse University	Study of intermediate carbohydrate metabolism in neurospora using radioactive carbon and biochemical mutants.	15,000

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
NORTH CAROLINA		
Medicine:		
Duke University	Metabolic studies with tracer techniques	$13,000
North Carolina, University of.	A study of ion transport across smooth muscle cell membrane	13,000
Do	The double isotope effect of Ca-45 and Sr-89 on the pattern of distribution in the body, particularly in bone.	10,500
Wake Forest College, Bowman Gray School of Medicine.	Formation of tissue phospholipids and toxicity of P-32 as related to dietary factors.	18,514
Biology:		
Duke University	Effects of ultraviolet light and gamma rays on cell lipids and the physiological action of irradiated lipids.	22,990
North Carolina State College.	The environmental factors influencing root behavior	8,000
North Carolina State College of Agriculture.	I—The comparative effect of irradiation upon mutation frepuency, total genetic variance, and progress from selection in different genotypes of peanuts and their hybrids; II—The Genetic characteristics of radiation injury resistance in peanuts.	17,379
Do	Genetic and developmental effects of ingested radioactives in habrobracon.	6,600
North Carolina State College.	Study of the effect of the diet on lipid metabolism using C-14	6,834
North Carolina, University of.	Study of genetic recombination as influenced by mutagenic and nonmutagenic environmental agents.	5,500
OHIO		
Medicine:		
Cincinnati, University of	Research on the biological effects of beryllium and its compounds	20,000
Western Reserve University.	Synthesis of nucleic acids by *Escherichia coli* and bacteriophage systems.	12,000
Do	Intermediary metabolism with isotopically labeled compounds in perfused organs, whole animals, and humans.	25,000
Western Reserve University.	An investigation of a recently isolated serum factor (properdin) in relation to its role in protecting against early death following exposure to ionizing radiation.	25,000
Do	Physiological function and histological changes in thyroids irradiated with radioactive iodine.	9,000
Do	Investigations of biological effects of internally deposited radioisotopes and related radio-biology studies.	190,000
Biology:		
Kent State University	Study of changes in certain biotic communities and animal populations through field investigations.	5,000
Oberlin College	Studies on the physiology of ion accumulation and electrolyte balance in living cells.	5,579
Ohio Agricultural Experiment Station.	Detailed characterization of soil and vegetation on selected sites to serve as basis for future evaluations of effects of radioactive contamination.	24,000
Ohio State University, Research Foundation.	Quantitative population genetics of mice under irradiation	20,000
Western Reserve University.	Intermediary metabolism of carbohydrates by bacteria	30,000
OKLAHOMA		
Medicine:		
Oklahoma Medical Research Institute.	Metabolism of radioactive sex hormones	11,000
Do	Androgen regulation of the incorporation of radioactively labeled amino acids into tissues.	12,000
Biology:		
Oklahoma A. and M. College.	Isotope investigation of the mechanism of nttrate reduction in bacteria.	4,500
Oklahoma, University of	The cytology and genetics of rediation resistance in bacteria	7,400
Do	Studies on the role of certain polyphenolic compounds in plant metabolism.	8,000
OREGON		
Medicine:		
Oregon, University of, Medical School.	Studies of hemic effects of radioisotopes, X-rays and of adrenocortical homones.	25,000
Do	Studies on lipogenesis	15,000

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
OREGON—continued		
Biology:		
Oregon State College	Effects of soil temperature and morphologic age of plants on the uptake and assimilation of readoactive phosphorus.	$7,700
Do	Mode of action of labeled 2, 4-dichlorophenoxyacetic acid and similar agents.	12,000
Do	Carbohydrate-amino acid interrelationships, using isotopic tracers.	11,800
Do	Intermediary metabolism of organic acids and proteins in certain fruits using isotopic tracers.	7,000
Oregon, University of	An investigation of the population genetics of the Pacific tree from (Hyla regilla).	5,800
Do	Investigation of lactose synthesis in mammary gland homogenates.	6,000
Reed College	Effect of ionizing radiation on biolchemical compounds	6,400
PENNSYLVANIA		
Medicine:		
Albert Einstein Medical Center.	Comparative enzymatic and biochemical studies of animal skin which has been irradiated with Alpha and Beta particles.	13,000
Do	The uptake of radioactive rubidium (RB-86) by tumors of the breast (benign and malignant) in humans.	3,000
Hahnemann Medical College.	The biochemical properties of microsomes and the effects of radiation on them.	10,000
Institute for Cancer Research.	Origin and fate of amino acids in plants and animals	12,000
Do	Metabolic studies on ethionine and derivatives	10,000
Jefferson Medical College	Metabolic and cytologic changes induced by metallic carbonyls	20,000
Do	Effects of radioactive particulates in lung tissue	22,000
Montefiore Hospital	Synthesis of nucleic acid purines in bone marrow	18,000
Nuclear Science and Engineering Corp.	A toxic substance produced by irradiation	25,000
Pennsylvania, University of.	Kinetics and mechanisms of ion transfer in the heart, and studies of altered cardiovascular physiology in cardiovascular disease states.	14,000
Do	Investigation of the use of Na-24 in cerebral edema, brain tumors, and focal epileptic lesions.	13,500
Philadelphia General Hospital.	Effect of X-ray radiation of the lipids of the skin	16,000
Pittsburgh, University of	Attempted modification of mammalian tumor radiosensitivity with agents and procedures altering host sensitivity.	11,700
Pittsburgh, University of, Medical School.	Study of the effects of radiation on immune response	30,000
Biophysics:		
Pittsburgh, University of	Hazard from inhaled radioactive particulate matter	20,000
Nuclear Science and Engineering Corp.	Radiostrontium analysis	60,000
Biology:		
Pennsylvania State University.	Investigations of pathways in plant metabolism	11,000
Do	Pathways of metabolism in bovine germ cells	3,800
Do	Internal organization of normal and phage-infected cells as influenced by radiation.	15,000
Do	Changes in the capillary fragility and the colloidal properties of blood following irradiation.	12,175
Do	Mutation rates in mormoniella	14,000
Pittsburgh, University of	Study of the correlation of radiation effects with physical and chemical changes in viruses.	13,932
Do	Genetic potential of certain populations of *Drosophila persimilis* from the Sierra Nevada of California.	9,500
RHODE ISLAND		
Biology:		
Brown University	Penetration of the gut wall by intestinal bacteria after X-irradiation.	6,700
Do	Radiation effects on the cytoplasm of Habrobracon eggs	5,700
SOUTH CAROLINA		
Biology:		
Clemson Agricultural College.	Investigation of mode of action of maleic hydrazide as plant growth regulator.	4,200
Do	Overwintering of *Xan homonas pruni*, the causal organism of bacterial spot of peaches.	3,256
South Carolina, University of.	Ecological study of the flora and fauna of the Savannah River plant area.	13,794

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
SOUTH DAKOTA		
Biology:		
South Dakota State College.	Metabolism of selenium and radiotactive sulfur in plants	$5,400
TENNESSEE		
Medicine:		
Meharry Medical College	Use of radioactive gold in treatment of tumors	40,000
Do	Effect of X- and Beta irradiation on free growth of malignant cells and on organized malignant tumors, and effect of pretreatment with biological and chemical agents.	12,000
Do	Autoradiographic study of the distribution of AgIII in the rat following administration of various routes.	10,000
Tennessee, University of	Studies in iodide metabolism	18,804
Do	Protective action bone marrow perfusates and AET in irradiated monkeys.	13,000
Do	Study of the effects of cobalt-60 Gamma irradiation on infection and immunity.	10,000
Do	Effect of internal irradiation on cellular metabolism	6,000
Do	Origin and fate of thiocyanate ion in metabolism	9,000
Tennessee, University of, School of Medicine.	Physiology of water and ionic balance in monkeys subjected to whole body radiation.	18,500
Tennessee, University of	The response of the reticulo-endothelial system to X-radiation	6,000
Do	The metabolism of serine in the intact rat	6,000
Vanderbilt University	Absorption and metabolism of lipids and vitamins and the alterations which occur in acute radiation injury.	23,000
Vanderbilt University, School of Medicine.	Metabolic fate of barbituric acid anesthetics with special reference to evipal.	7,000
Vanderbilt University	Fetal irradiation and the patterns of behavior development	7,000
Biophysics:		
Vanderbilt University	Nuclear physics studies on instrumentation problems	7,780
Biology:		
Christian Brothers College	Uranium complexes with amino acids and peptides	4,000
Tennessee, University of	Survey of the effects of radiation on animals parasitized with *Taenia pisiformis*, on the parasites of the irradiated animals and on the parasites per se.	8,400
Do	Vegetation studies related to disposal of radioactive wastes	10,500
TEXAS		
Medicine:		
Southwestern Medical School, University of Texas.	The metabolism of doubly labeled serum albumin	8,000
Southwest Foundation for Research and Education.	Investigation of in vitro organ maintenance technique for production and isolation of post-irradiation recovery factors.	50,000
Texas Technological College.	The effects on rat behavior of developmental aberrations induced by ionizing radiation in utero.	17,500
Texas, University of, M. D. Anderson Hospital and Tumor Institute.	Physical and radiobiological investigations with 22 MEV X-rays and electrons, as compared with cobalt-60 and 250 kilovolt X-rays.	12,500
Biophysics: Texas Agricultural and Mechanical College.	Study of radioactive waste disposal at sea	25,000
Biology:		
Rice Institute	Endocrine and metabolic studies utilizing radioisotopes and labeled hormones.	14,500
Stephen F. Austin State College.	The effect of radiation on a natural population of *Peromyscis gossypinus*.	4,800
Texas, University of	Direct and indirect effects of radiation on genetic and developmental systems of vertebrates.	9,000
Do	Studies of the metabolic processes in molds and fungi using carbon-14.	10,203
Do	Research on direct and indirect effects of radiation on genetic systems of organisms.	24,840
Do	Effects of various types of irradiation on growth responses, metabolism and electrical pattern of the *Avena coleoptile* and earthworms.	6,000
Do	The genetic and biochemical effects of radiation on bacteria	4,410
Texas Agricultural and Mechanical College.	Biosynthesis, metabolism and mechanism of action of plant growth substances.	9,000
UTAH		
Medicine:		
Utah, University of	Metabolism of trace elements in animals and man with specific reference to their role in erythropoiesis.	11,000
Do	The pathways of glucose oxidation in the pancreas	7,830

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
UTAH—continued		
Biophysics:		
Utah, University of	Toxicity studies of plutonium and other radioactive substances in animals.	$270,000
Biology:		
Brigham Young University	The effects of X-irradiation upon embryonic development in the paradise fish, *Macropodus opercularis*.	3,300
Do	Studies on the oxygen evolving system in photosynthesis	5,000
Utah State Agricultural College	Use of radioactive phosphorus P-32 in labeling plant viruses to facilitate their isolation by means of paper electrochromatography.	7,200
Do	Effect of radioactive elements and radiation on ewes maintained on different levels of nutrition.	28,000
Do	Use of radioiron in studying lime-induced chlorosis	8,700
Utah, University of	Radiation effects on the photosynthesis and metabolism of higher plants.	15,987
VERMONT		
Biology:		
Vermont, University of	Relationship of the pyruvate oxidation system to growth stimulation by antibiotics and other compounds.	9,000
VIRGINIA		
Medicine:		
Virginia, University of	Metabolic exchange of radioactive isotopes in isolated cell systems.	9,000
Biophysics:		
Virginia, University of	Study of the kinetics and reactivity of cell surface components as affected by ionizing radiation.	6,300
Biology:		
Longwood College	Effects of radiation on root growth of higher plants	7,000
Virginia Agricultural Experimental Station.	Kinetic studies of the in vitro metabolism of uniformly C-14 labeled glucose by rumen microorganisms.	9,000
Virginia, University of	A study of the pituitary glands of thyroidectomized newts	6,300
Do	Radiation effects on growing plants	16,000
WASHINGTON		
Medicine:		
Washington, University of	Erythropoiesis and iron metabolism	21,800
Do	Mobilization of radioactive emitters from bone	15,000
Do	Hemodynamics; blood dynamics as measured by simultaneous multiple port scintillation detection of I-131 human serum albumin.	12,000
Do	Enzymatic components and physiological function in the erythrocyte.	13,000
Do	Studies of isotopically labeled hormones	15,000
Biophysics:		
Washington, University of	Atmospheric turbulence study	9,000
Biology:		
Washington, State College of.	I. A study of phosphorus metabolism in the phloem tissues of plants as it is related to the translocation of phosphorus; II. A study of the movement of tritiated water in the phloem of plants.	10,500
Do	Study of factors influencing the biological effects of X-rays	11,000
Washington, University of	The metabolism of molecular hydrogen, deuterium, and tritium	9,400
WISCONSIN		
Medicine:		
Wisconsin, University of	Effect of irradiation of brain on learned and unlearned behavior of monkeys and chimpanzees.	41,000
Biophysics:		
Marquette University	Pathological effects of radioactive isotopes of calcium and strontium on bone and soft tissue.	15,785
Wisconsin, University of	Biological applications of historadiographs	10,000
Biology:		
Marquette University	Temperature prevailing during exposure as a modifying factor in the dose-response relationship of X-rayed mammalian skin.	13,000
Do	Nucleolytic enzymes	10,908
Wisconsin, University of	Radiotracer studies on the mechanism of insecticidal toxicity	6,600
Do	Effect of radiation on enzymes in the cyclophorase system	20,500
Do	Radioisotope exchange studies in lakes	6,500
Do	The iron, manganese and copper cycles in aquatic insect populations.	5,200

Compilation of university research contract program by State, institution, and title—Continued

Institution	Project title	Estimated amount
HAWAII		
Biology:		
Hawaii, University of	1. The utilization and evaluation of isotope techniques for the determination of algae productivity in the tropical Pacific; 2. The role of benthic algae in the Central Pacific.	$12,143
Do	Radioisotope uptake in marine organisms with reference to passage of such isotopes as are liberated from atomic weapons through food chains leading to organisms utilized as food by man.	34,000
Do	Technical and administrative function of Eniwetok Marine Biological Laboratory operation.	25,000
PUERTO RICO		
Biology:		
Puerto Rico Agricultural Experiment Station.	Radioactive iron studies with soil and crops of Puerto Rico	4,000
DISTRICT OF COLUMBIA		
Medicine:		
Garfield Memorial Hospital.	Investigation of distribution, localization, and excretion of tagged triethylene thiophosphoramide following injection by various routes.	15,000
Georgetown University	Study of intermediary carbohydrate metabolism by means of labeled compounds.	10,000
Georgetown University School of Medicine.	Source of the liver glycogen resulting from the administration of cortisone.	6,000
Do	Isotopes in cardiac disease	10,000
George Washington University.	Effects of radiation on biosynthesis and degradation of nucleoproteins.	14,000
Do	Continuous blood volume recording with tracers in patients under anesthesia and during surgery, with special regard to specific physiological conditions.	12,200
George Washington University.	The dose-incidence relationship of beta radiation-induced skin cancer in the rat.	7,500
Howard University	A study of the chronic hemodynamic alterations induced in dogs with various cardiac lesions following production of experimental hypertension.	9,000
U. S. Navy, Bureau of Ships.	Medical reexamination of the Marshallese	10,000
Smithsonian Institution	Biosciences information exchange	30,000
Biophysics:		
U. S. Department of Agriculture, Soil Conservation Service.	Collection and preparation of samples of soils, plants, and animals for calcium and strontium analysis.	15,000
American Polar Basin Expedition.	Collection of sunshine (fallout) samples in the Arctic region	32,000
U. S. Department of Health, Education, and Welfare.	Public health—monitoring program	35,000
Howard University	Kinetic and mass spectrometric studies of biophysical systems with radioactive and stable isotopes.	16,200
U. S. Department of Commerce, National Bureau of Standards.	Various projects—radiation physics as related to dosimetry and radiation protection.	162,000
U. S. Navy Research Laboratory.	Radioactivity monitoring program	16,000
U. S. Department of Commerce, U. S. Weather Bureau.	Correlation of meteorological trajectories with fallout of atomic debris.	43,000
Biology:		
U. S. Department of Agriculture.	Accumulation and movement of fission products in soils and plants.	80,000
Do	The intermediary metabolism of proteins and amino acids in avian and mammalian species.	43,500
Howard University	Relation of ascorbic acid to cholesterol	8,500
U. S. Department of Interior.	Accumulation of fission products by marine fish and shellfish	42,580
National Academy of Sciences.	Chemical—biological coordination center	10,000
U. S. Navy, Bureau of Ships.	Reexamination of the Marshall Islands	10,000
Smithsonian Institution	Biochemical investigation of radiant energy as it affects photomaturation in green plants.	9,600
Do	Specific biological indicators of ionizing radiation and the mechanism of its action.	15,000

Mr. FOGARTY. Thank you very much.

SUPPLY AND DEMAND FOR SCIENTISTS

Now, I have just one more question. I wish you would supply for the record how many trained scientists today are graduated in a year, how many are needed for atomic energy alone, and when the supply will meet the demand, in your opinion.

Thank you very much, Mr. Chairman.

Estimated number of graduates in science and engineering at the bachelors and doctor of philosophy levels, 1956, 1960, and 1965 [1]

Degree level and field	Year		
	1956	1960	1965
Bachelor:			
Science	30,000–35,000	36,000–44,000	52,000–57,000
Engineering	29,000–30,000	35,000–43,000	51,000–56,000
Total	59,000–65,000	71,000–87,000	103,000–113,000
Doctor of philosophy: Science and engineering	4,500	5,800	8,200

[1]Source: National Science Foundation, Trends in the Employment and Training of Scientists and Engineers, Washington 25, D. C., 1956.

The table indicates substantial increases in the number of graduates in science and engineering over the next decade.

DEMAND IN ATOMIC ENERGY WORK

The atomic energy program has not been free of difficulties in recruiting and maintaining a staff of qualified scientists and engineers. While there has not yet been a serious impact on the basic program of the AEC, there is considerable concern about the needs for the emerging atomic energy industry. In a survey of some 200 companies either in or planning to enter the field, there was a great discrepancy between the numbers of nuclear scientists and engineers that industry expects to obtain during the next 3 years and the expected supply during the same period.

The problems in the atomic energy field are different in some respects than those in the overall economy. Thus far, the attractions of a career in atomic energy have minimized the effects of the shortages on these programs. However, even with keen interest on the part of scientists and engineers to enter atomic energy work, there have not been enough training resources to provide them with the specialized skills they need to adapt their basic background.

While in the long run AEC will rely on the regular educational institutions to provide the scientists and engineers needed for the growing atomic energy industry, and is providing assistance to these institutions, for the interim period the Commission is conducting certain programs to meet current professional manpower needs. In this way, a balance between supply and demand can be achieved for atomic programs within the next few years, provided the supply is not more seriously affected by a general shortage of scientists and engineers.

Even if all atomic energy programs are adequately staffed, it cannot be without some toll on other institutions, many of which are defense oriented. The total needs for scientists and engineers in all atomic energy programs in 1956 are about 16,000, more than half of which are engineers and the bulk of the remainder physical scientists. Based on a number of assumptions made in the report of the Panel on the Impact of the Peaceful Uses of Atomic Energy, the number required will rise to between 41,000 and 63,000 by 1975. Thus, over a period of time, atomic energy programs will require a larger and larger share of total scientific manpower resources.

FUTURE OUTLOOK

As indicated in the table, we can expect the number receiving degrees in science and engineering to increase substantially during the next decade. However, the demand is likely to increase rapidly as well, and even with large graduating classes in science and engineering, we might not fully satisfy all of the needs. Of particular concern is the fact that although the number of doctorates granted will be considerably larger in 1965 than this year, it is doubtful whether the quantities will be sufficient considering the growing requirements for individuals to assume leadership in the various scientific and engineering programs.

Mr. CANNON. Mr. Riley.

PROCEDURE FOR OBTAINING LICENSE TO BUILD ATOMIC POWERPLANT

Mr. RILEY. Mr. Strauss, will you tell us what procedure commercial producing companies must follow to obtain a contract and a license to build atomic plants?

Mr. STRAUSS. When you say atomic plant, you mean a powerplant?

Mr. RILEY. Yes.

Mr. STRAUSS. Let me give you the precise order of the steps by asking Mr. Price, who is in charge of that division, to outline it.

Mr. PRICE. I am sorry, Mr. Riley, I did not get the first part of your question.

Mr. RILEY. I asked for the procedure that a commercial company would have to follow in order to obtain a contract or license to build an atomic powerplant.

Mr. PRICE. Of course, a commercial company wanting to build an atomic powerplant does not need a contract with the Commission unless they want financial assistance for participation in the development or operation of the plant. If the project is entirely privately financed, the company could file an application for a license. They have to make a showing of financial responsibility, technical competence of the people that are going to be in charge, and they have to make a very detailed showing of the ways in which they will protect their employees and the public against the hazards of radiation that have been talked about. It is this evaluation from a hazard standpoint that is the most important and the most detailed. That is the big part in licensing procedures.

Mr. RILEY. If they meet the Commission's criteria, there is no limit to the number of plants that you would license?

Mr. PRICE. That is right. The only limit to the number of plants that we would license that are entirely privately financed would be assuming they met our criteria, safety requirements and others, would be in the possibility of a shortage of material which, as you have heard today, we do not anticipate.

Mr. RILEY. Thank you, sir.

Mr. Strauss, there is one other question. I was very much interested in your discussion of research and development on rockets or guided missiles. Would it be possible to develop a missile that would have a motor or propulsion machinery of a rocket type?

Mr. STRAUSS. By atomic energy?

Mr. RILEY. Yes.

(Discussion off the record.)

Mr. CANNON. Mr. Evins.

Mr. EVINS. I will not take long, but I do have a few observations.

Mr. Strauss, I certainly respect you as a very able gentleman, and as the Chairman of a very important Commission, a very great Commission. I wish I could share the applause of our chairman for your Commission.

I should add I have no reason why I should not, except for the fact of press reports regarding the Atomic Energy Commission for the past few years have indicated much bickering and discord within the Commission. The inner Commission disputes I believe have caused the public regard and esteem for your Commission to decline. I have no personal reasons for criticizing your Commission, but I believe the public respect has somewhat declined because of the inner bickerings and disputes within the Commission.

EXCHANGE OF INFORMATION WITH OTHER COUNTRIES

Now, certainly there can be no proper criticism of the atomic energy program for the development of guided missiles and atomic weapons but perhaps some criticism can be made with respect to the extent of providing information and data, as a result of our own development, to our allies and foreign countries. Your testimony indicates that more than 30 nations are receiving under bilateral agreements information from this Commission, and that 40 nations have been given technical libraries and information from the Atomic Energy Commission. I am wondering what our country is gaining in the way of information from the others? Are they not the recipient of more information and greater advantage than to our country in these exchanges?

Mr. STRAUSS. I will first comment on your opening statement. You seem to feel that it is a mistake for a difference of opinion to exist in the Commission. I hope that on reconsideration you will conclude that it is rather better that all points of view should be expressed in the Commission. To term it bickering is, I think, an injustice that some elements of the press have forced upon us. There are differences of opinion. I mentioned the fact that the approval of the Yankee contract was an approval by a majority with a dissenting vote. The majority believed it was a good contract. The only way that "bickering" could have been avoided would have been to—I put the bickering in quotations—would have been to have rejected the contract, which the majority were unwilling to do, or for the minority member to have agreed to it.

Now, it is inevitable in the conduct of the affairs of the Commission or in the conduct of the affairs of the great deliberative body of which you are a member, for differences of opinion not to exist. I certainly feel that it is in the interest of the people that those differences be aired.

With respect to your point about the exchange——

Mr. PHILLIPS. Mr. Strauss, you know there have been differences of opinion even in this committee.

Mr. EVINS. I want to say I respect differences of opinion, but the press reports of the things that have gone on in the Commission have not been complimentary of the Commission—More than just intellectual differences of academic opinion.

Mr. STRAUSS. In some places they have been and in others they have not.

Mr. EVINS. This has not been the case with respect to most of our independent regulatory agencies and commissions.

Mr. STRAUSS. We are more than a regulatory agency. We are an operating agency, and we have to make decisions daily. You can avoid differences of opinion by having one man run it. That I think would be very bad, and I have so testified.

With respect to the exchange of information with other countries, I think it is obvious that with the head start that we have, sir, in this field over the rest of the world, that we will for a considerable period of time be on the giving side on balance to most of the countries with which we are making agreements. We have received information of value from some of the countries with which we do business. We receive material of value, let us say, from Belgium, from Australia, from Portugal, from Canada. It is true we pay for it, but we do not pay as much to some countries as we do to our own producers. Most of the information which we are exchanging, and the libraries which we are contributing, and which have a very small intrinsic value, most of the information is in the open category in any case, and what we are giving to these countries is then in effect a service by providing them with the collected information——

Mr. EVINS. Mr. Strauss, I don't think the committee is too much alarmed about the intrinsic value. I am sure I am not. I am sure that it is small. I am concerned about the providing of important and vital information to our so-called friendly allies today who might not be allies tomorrow, and giving them the benefit of the information developed by our country that ultimately could be used against this Nation.

Mr. STRAUSS. In respect to that, sir, the Commission before it enters into one of these agreements, makes a finding that it is in the interest of the common defense and security. It submits that to the President. The President either approves or disapproves that finding. It is then sent to the Congress. It does not become a binding obligation upon the United States Government until it has laid before the Congress 30 days, while Congress is in session. So that any objection to the conclusion of the Commission or of the President could be acted upon by the Congress.

Mr. EVINS. It is true on balance we are giving much more than we are receiving in this field?

Mr. STRAUSS. I think I would subscribe to that, as of the present moment, yes, sir.

PROGRESS BY THE FEDERAL GOVERNMENT AND PRIVATE INDUSTRY

Mr. EVINS. Now, Mr. Strauss, we know that your Commission has been in operation for more than 15 years, and for a good number of years the country and the Congress has been waiting for the Commission to go forward with the development of atomic reactors, and give us the answer to all these things. We know you are doing a job, but I suppose we have expected more—much more. Since the Commission has not provided the answers, why, then the Congress took action. We have said in effect that the time has come for industry to be brought in, for the Commission to bring industry in for development of atomic power——

Mr. STRAUSS. That was the recommendation of the Commission.

Mr. EVINS. That was the recommendation of the Commission, that won approval of the Congress.

Mr. STRAUSS. That is right.

Mr. EVINS. Now, since Congress has acted, industry is not progressing or proceeding and neither industry nor the Commission has given us the results desired, or expected.

Mr. STRAUSS. That is contrary to the facts, sir. The Commission has been in existence, not 15 years, but since January 1, 1947. It was authorized by act of Congress signed by President Truman on July 31——

Mr. EVINS. Then I was wrong in understanding your statement was that your "enterprise" was underway for some 15 years?

Mr. STRAUSS. No, I said that the atomic energy enterprise of the Government has been under way since the Government undertook it as a wartime project in 1942. The Atomic Energy Commission was authorized by Act of Congress signed by President Truman on July 31, 1946. Mr. Truman appointed members of the Commission, the first Commission, most of whom were sworn in in October or November 1946, and the Commission took over the enterprise from the Army Corps of Engineers on January 1, 1947. Up until the spring of 1954 there was not sufficient progress made in the development of atomic power for the Commission to have invited industry to participate, but prior to the enactment of the act of 1954, which became law in August of that year, the Commission did succeed in obtaining an arrangement with the Duquesne Light Co. of Pittsburgh to build the reactor at Shipping port, Pa., which represents the contribution of that company for the entire cost of the site, the entire cost of the generating equipment, a $5 million contribution toward the reactor, the entire cost toward the operating employees and the contract to buy the energy, the heat, from the Commission for 8 mills, a total investment we figure over the life of the reactor and the contract of something like 30 million.

The Westinghouse Co. which is to build that decided after the contract had been signed that it would turn in its profits which it estimated at about a half million dollars. That is just one reactor.

Mr. EVINS. I want to applaud the Commission in its good work. My observation is directed to the fact that perhaps we as a country are too impatient. We have waited and expected the Commission to provide us with answers when the Commission had not fully provided. Then we turned to industry, and there is an impression today in the country that private industry has slowed the progress down, that the coal industry may not be in favor of atomic development, the private electric power industry may not be in favor of industry developing this nuclear power.

You have also testified in your own statement that England having a shortage of coal supply is making further advance than this Nation.

Mr. STRAUSS. I did not say that.

Mr. EVINS. I gained the impression that England with its shortage of coal supply and with its shortage of hydroelectric power supply, the Government is moving forward in this field. We as a Government are not moving with dispatch in this field. We have turned our scientific and development information over to private industry, and private industry is not going forward at the pace at which we as a Nation, perhaps impatient, expect them to go forward. I am asking for your observation on those comments.

Mr. STRAUSS. I don't know how you could arrive at those conclusions after hearing my statement. You mentioned private power companies. I named 2 of them, Commonwealth Edison and Consolidated Edison, which 2 companies are embarking on 2 large atomic projects for us. They have not asked the Federal Government for anything except our good will and cooperation.

Mr. EVINS. Are they proceeding as rapidly as the Commission feels in this regard?

Mr. STRAUSS. No; I think they cannot proceed until Congress has taken action on the insurance bill which has been introduced by Senator Anderson or some bill of that character and I very much hope, sir, you will take action on it at this session, and that ground will be broken for these plants in due course.

There was mentioned the Yankee situation, and I listed a number of others, including two cooperatives, which are also dealing with us in this matter. I think great progress has been made. It is true I am speaking from a prejudiced point of view, but I call your attention to the fact that none of these plants which are now being built will be economic. No one who is building a plant today is expecting to make any money from it. Therefore, I think that industry is doing a very considerable job for the whole country.

Mr. EVINS. I want to applaud industry and commend industry and we are all interested in free enterprise and private enterprise, but I will disagree with the Chairman's statement when he says that private industry will not be interested in making money out of this development on which the Government has spent so much money thus far on nuclear power development.

Mr. STRAUSS. I did not say they would not be interested in making money. They will be interested in making money out of it, sir, but that cannot be done with these plants that are now contemplated. These plants that are now contemplated are now recognized to be uneconomic.

Mr. EVINS. Will you supply for the record the 750 organizations and industries which have been granted permits for access to information from the Commission?

Mr. STRAUSS. That will be done.

(The information requested follows:)

Access permits issued

MAY 1 THROUGH MAY 31, 1956

Permit holder	Address	Permit No.	AEC office implementing permit
Aerojet General Nucleonics	1529 Cypress, room 107 Walnut Creek, Calif.	923	San Francisco.
Aetna Insurance Co	670 Main St., Hartford, Conn	918	New York.
Airborne Instruments Laboratory, Inc.	160 Old Country Rd., Mineola, N. Y	910	Do.
American Bureau of Shipping	45 Broad St., New York, N. Y	917	Do.
Arkwright Mutual Fire Insurance Co.	60 Batterymarch St., Boston, Mass	947	Schenectady.
Armour Research Foundation of Illinois Institute of Technology.	10 West 35th St., Chicago, Ill	915	Chicago.
Boone County Rural Electric Membership Corp.	1207 Indianapolis Ave., Lebanon, Ind	930	Do.
Francis C. Carr & Co., Inc	149 Broadway, New York, N. Y	942	New York.
City Public Service Board	Post Office Box 1771, San Antonio, Tex.	927	Albuquerque.
Columbus & Southern Ohio Electric Co.	215 North Front St., Columbus, Ohio	934	Chicago.

Access permits issued—Continued

MAY 1 THROUGH MAY 31, 1956—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
Continental Uranium, Inc	Post Office Box 1550, Grand Junction, Colo.	924	Grand Junction.
Cummins & Barnard, Inc	109-109½ East Washington St., Ann Arbor, Mich.	937	Chicago.
Delaware Power & Light Co	600 Market St., Wilmington, Del	893	New York.
E. I. du Pont de Nemours & Co	Wilmington, Del	948	Do.
East Kentucky Rural Electric Cooperative Corp.	503 McEldowney Bldg., Winchester, Ky.	954	Oak Ridge.
Eastern Precision Resistor Corp	675 Barbey St., Brooklyn, N. Y	944	New York.
Farrel-Birmingham Co., Inc	Ansonia, Conn	919	Do.
(Alvin) Clark Gray	Rural Route No. 5, Davenport, Iowa	925	Chicago.
Haller, Raymond & Brown, Inc	124 North Atherton St., State College, Pa.	921	New York.
Felix Harris & Co	212 North Field St., Dallas, Tex	922	Albuquerque.
Indiana State Board of Health	1330 West Michigan St., Indianapolis, Ind.	907	Chicago.
Industrial Nucleonics Corp	1205 Chesapeake Ave., Columbus, Ohio.	950	Do.
International EngineeringCo., Inc	74 New Montgomery St., San Francisco, Calif.	936	San Francisco.
Isotopes Specialties Co., Inc	703 South Main St., Burbank, Calif	945	Albuquerque.
Johns-Manville Products Corp	22 East 40th St., New York, N. Y	931	New York.
Walter Kidde Engineers-Southwest, Inc.	1205 Holman Ave., Houston, Tex	935	Albuquerque.
Laclede-Christy Co., division of H. K. Porter Co., Inc.	2000 Hampton Ave., St. Louis, Mo	939	Oak Ridge.
Lake Superior District Power Co	101 West 2d St., Ashland, Wis	940	Chicago.
Robert Narvaez Little, Jr	Physics Building 304, University of Texas, Austin, Tex.	906	Albuquerque.
Frederick Farwell Long	2217 Providence Ave., Chester, Pa	913	New York.
John L. McMahan	400 Mamaroneck Ave., White Plains, N. Y.	941	Do.
Miller, Canfield, Paddock & Stone	3456 Penobscot Bldg., Detroit, Mich	920	Chicago.
Morrison-Knudsen Co., Inc	319 Broadway, Boise, Idaho	926	Idaho.
National Board of Fire Underwriters.	85 John St., New York, N. Y	898	New York.
National Steel Corp., Weirton Steel Co. division.	Weirton, W. Va	928	Chicago.
New Jersey State Department of Health.	State House, Trenton, N. J	929	New York.
Radioactive Products, Inc	2421 Wolcott Ave., Ferndale 20, Mich	943	Chicago.
Shreve, Walker & Associates, Inc	600 Woodward Ave., Detroit, Mich	932	Do.
Superior Tube Co	Post Office Drawer 191, Morristown, Pa.	905	New York.
Timax Corp	153 East 26th St., New York 10, N. Y	916	Do.
United Brotherhood of Carpenters and Joiners of America.	222 East Michigan St., Indianapolis, Ind.	938	Chicago.
United States Yttrium, Inc	109½ South 2d St., Laramie, Wyo	949	Grand Junction.

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Allegheny Ludlum Steel Corp	2020 Oliver Bldg., Pittsburgh, Pa	912	Schenectady.
American Mutual Reinsurance Co	919 North Michigan Ave., Chicago, Ill.	903	Chicago.
Artisan Metal Products, Inc	73 Pond St., Waltham, Mass	889	Schenectady.
Atomic Energy Waste Disposal Service.	5410 Bond St., Oakland, Calif	855	San Francisco.
Avco Manufacturing Corp	420 Lexington Ave., New York, N. Y	825	New York.
Avionics Research Corp	411 Hempstead Trunpike, West Hempstead, N. Y.	870	Do.
David T. Barish	28 Tacoma Lane, Syosset, N. Y	813	Do.
Bell Aircraft Corp	Post Office Box 1, Buffalo, N. Y	877	Do.
Bigelow Boysen	Willard Hotel, Washington, D. C	909	Washington civilian application.
W. A. Brown & Associates, Inc	3610 Mount Vernon Ave., Alexandria, Va.	868	Do.
The California-Oregon Power Co	216 West Main St., Medford, Oreg	882	Chicago.
California Precision Castings, Inc	1721 Standard Ave., Glendale, Calif	888	Albuquerque.
Climax Molybdenum Co	500 5th Ave., New York, N. Y	878	New York.
Combustion Engineering, Inc	200 Madison Ave., New York, N. Y	856	Schenectady.
Dairyland Power Cooperative	2615 East Ave., South La Crosse, Wis	854	Chicago.
Diamond Alkali Co	300 Union Commerce Bldg., Cleveland, Ohio.	844	Do.
Diamond Power Specialty Corp	Box 415, Lancaster, Ohio	900	Do.
Douglas Aircraft Co., Inc	3000 Ocean Park Blvd., Santa Monica, Calif.	881	San Francisco.
Eclipse Fuel Engineering Co	1100 Buchanan St., Rockford, Ill	897	Chicago.
Hagan Corp	323 4th Ave., Pittsburgh, Pa	823	Do.

Access permits issued—Continued

APR. 1 THROUGH 30, 1956—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
The Hamilton Chemical Co., Inc.	1723 East Oliver St., Baltimore, Md.	864	Oak Ridge.
Harza Engineering Co	400 West Madison St., Chicago, Ill.	871	Chicago.
Hastings Instrument Co., Inc.	Newcomb Ave, Hampton, Va	899	Oak Ridge.
Herring-Hall-Marvin Safe Co	1550 Grand Blvd, Hamilton, Ohio	914	Chicago.
High Voltage Engineering Corp.	7 University Rd., Cambridge, Mass.	836	New York.
International Testing Laboratories, Inc.	578–582 Market St., Newark, N. J.	891	Do.
Isotopes, Inc	123 Woodland Ave., Westwood, N. J.	830	Do.
Fred S. James & Co	1 North La Salle St., Chicago, Ill	828	Chicago.
William Kerr	University of Michigan, Ann Arbor, Mich.	872	Do.
Gerald Kleiman	193 Keats Ave., Elizabeth, N. J.	867	New York.
Knapp Mills, Inc	23–15 Borden Ave., Long Island City, N. Y.	850	Do.
Larco Nuclear Instrument Co	118 Union St., Palisades Park, N. J.	861	Do.
Robert LeBaron	1701 K St. NW., Washington, D. C.	886	Washington civilian application.
Lord Manufacturing Co	1635 West 12th St., Erie, Pa.	895	Chicago.
S. Sterling McMillan	Western Reserve University, Cleveland, Ohio.	812	Do.
Mitten Chemicals, Inc	806 East Superior, Alma, Mich.	911	Do.
The Mosler Safe Co	Grand Blvd., Hamilton, Ohio	901	Do.
National Industrial Conference Board, Inc.	460 Park Ave., New York, N. Y.	908	New York.
Northern States Power Co	15 South 5th St., Minneapolis, Minn.	874	Chicago.
The Ohio Oil Co	539 South Main St., Findlay, Ohio	896	Do.
Oklahoma Gas & Electric Co	321 North Harvey St., Oklahoma City, Okla.	875	Do.
Pacific Power & Light Co	Public Service Bldg., 920 South West 6th Ave., Portland, Oreg.	879	Idaho.
Penn-Texas Corp	111 Broadway, New York, N. Y.	831	New York.
Quaker Rubber division, H. K. Porter Co., Inc., of Pittsburgh.	Tacony and Comly Sts., Philadelphia, Pa.	894	Do.
Radiological Service Co., Inc	28–22A Astoria Blvd., Long Island City, N. Y.	890	Do.
Rensselaer Polytechnic Institute	110 8th St., Troy, N. Y.	887	Schenectady.
Royal Indemnity Co	150 William St., New York, N. Y.	892	New York.
San Diego Gas & Electric Co	861 6th Ave., San Diego, Calif.	869	Chicago.
School of Engineering, University of South Carolina.	745 Sumter St., Columbia, S. C.	880	Savannah River.
Sho-Me Power Corp	Marshfield, Mo	873	Oak Ridge.
Sigma Chemical Co	4648 Easton Ave., St. Louis, Mo.	883	Do.
E. H. Smith & Co	901 Pershing Dr., Silver Spring, Md.	859	Washington civilian application.
James C. Stowers	c/o ACF Industries, 30 Church St., New York, N. Y.	884	New York.
Technical Enterprises, Inc	31 South St., New York, N. Y.	876	Do.
Tennessee Corp	61 Broadway, New York, N. Y.	885	Do.
Tool Designers, Inc	1776 Lexington Ave., Cincinnati, Ohio	902	Chicago.
Touche, Niven, Bailey & Smart	233 Broadway, New York, N. Y.	904	New York.
Unexcelled Chemical Corp	350 5th Ave., New York, N. Y.	862	Do.
Virginia-Carolina Chemical Corp.	401 East Main St., Richmond, Va.	858	Oak Ridge.
The Washington Water Power Co.	West 825 Trent Ave., Spokane, Wash.	843	Idaho.
Wisconsin Public Service Corp.	1029 North Marshall St., Milwaukee, Wis.	851	Chicago.

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Aerial Products, Inc	Elkton, Md	837	Oak Ridge.
Alabama Electric Cooperative, Inc.	231 South Cotton St., Andalusia, Ala.	853	Savannah River.
George Armistead & Co	1200 18th St. NW., Washington, D. C.	834	Washington civilian application.
Barco Manufacturing Co	500 North Hough St., Barrington, Ill.	833	Chicago.
Beryl Ores Co	Box 409, Route 1, Arvada, Colo.	818	Albuquerque.*
J. Bishop & Co. platinum works	Malvern, Pa	800	New York.
Blodgett & Colley, Inc	16 Court St., Boston, Mass.	811	Schenectady.
Bridgeport Brass Co	30 Grand St., Bridgeport, Conn.	829	New York.
Carter Laboratories, Inc	2265 East Foothill Blvd., Pasadena, Calif.	839	Albuquerque.*
Celanese Corporation of America	180 Madison Ave., New York, N. Y.	809	New York.
Climax Molybdenum Company of Michigan.	14410 Woodrow Wilson, Detroit, Mich.	803	Chicago.
Dean Carl Dunlavey	Harvard Law School, room 4, Langdell Hall, Cambridge, Mass.	814	Schenectady.
George L. Erion Associates, Inc.	521 5th Ave., Suite 808, New York, N. Y.	819	New York.
Dr. Eugene K. Falls	4445 North River Rd., Port Huron, Mich.	817	Chicago.

Access permits issued—Continued

MAR. 1 THROUGH 31, 1956—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
The H. K. Ferguson Co	Ferguson Bldg., 1783 East 11th St. Cleveland, Ohio.	789	Chicago.
Firth Sterling, Inc	3113 Forbes St., Pittsburgh, Pa	821	Do.
Ford Motor Co	3000 Schaefer Rd., Dearborn, Mich	775	Do.
Harold P. Green	1700 K St., NW., Washington, D. C	847	Washington civilian application.
Hartford Accident & Indemnity Co.	690 Asylum Ave., Hartford, Conn	840	New York.
Holmes & Narver, Inc	828 South Figueroa, Los Angeles, Calif.	798	Albuquerque.[1]
Johnson & Higgins	63 Wall St., New York, N. Y	801	New York.
Stuart McLain	921 60th Pl., Downers Grove, Ill	848	Chicago.
Malt & Ness	640 Delaware Ave., Buffalo, N. Y	865	New York.
Management Consultants, Inc	871 McCallie Ave., Chattanooga, Tenn.	852	Oak Ridge.
Massachusetts Department of Commerce.	334 Boylston St., Boston, Mass	849	Schenectady.
Metal Hydrides, Inc	12-24 Congress St., Beverly, Mass	791	Do.
National Aluminate Corp	6216 West 66th Pl., Chicago, Ill	860	Chicago.
Nuclear Measurements Corp	2460 North Arlington Ave., Indianapolis, Ind.	866	Do.
Ohio Edison Co	47 Main St., Akron, Ohio	845	Do.
Harold A. Ohlgren	University of Michigan, 121 Cooley Bldg., Ann Arbor, Mich.	784	Do.
Orlando Utilities Commission	102 Wall St., Orlando, Fla	820	Savannah River.
Pioneer Service & Engineering Co	231 South La Salle St., Chicago, Ill	842	Chicago.
Portland General Electric Co	621 Southwest Alder St., Portland, Oreg.	785	Hanford.
Precision Technology, Inc	66 South P St., Livermore, Calif	816	San Francisco.
The Rand Corp	1700 Main St., Santa Monica, Calif	810	Albuquerque.[1]
Ray Proof Corp	513 West 54th St., New York, N. Y	805	New York.
Reichhold Chemicals, Inc	525 North Broadway, White Plains, N. Y.	786	Do.
Republic Steel Corp	25 Prospect Ave., Cleveland, Ohio	797	Chicago.
Reynolds Metals Co	Third and Grace Sts., Richmond, Va	815	Oak Ridge.
Reynolds Mining Corp	do	807	Do.
St. Regis Paper Co	230 Park Ave., New York, N. Y	795	Savannah River.
Sawhill Tubular Products, Inc	Post Office Box 546, Sharon, Pa	863	Chicago.
Sherman & Co	36-07 Prince St., Flushing, N. Y	835	New York.
South Dakota State Department of Health.	Pierre, S. Dak	846	Grand Junction.
Specialloy, Inc	4025 South Keeler Ave., Chicago, Ill	793	Chicago.
Sverdrup & Parcel, Inc	915 Olive St., St. Louis, Mo	824	Oak Ridge.
Technical Publishing Co	110 South Dearborn St., Chicago, Ill	806	Chicago.
Tennessee Department of Public Health.	Cordell Hull Bldg., Nashville, Tenn	838	Oak Ridge.
Todd Shipyards Corp	1 Broadway, New York, N. Y	832	San Francisco.
United States Radium Corp	Post Office Box 380, Bloomsburg, Pa	841	New York.
Lansing B. Warner, Inc	4210 Peterson Ave., Chicago, Ill	826	Chicago.
Washington Engineering Co., Inc	1025 Connecticut Ave. NW., Washington, D. C.	857	Washington.
Watson & Deutschman	409 Chamber of Commerce Bldg., Miami, Fla.	808	Savannah River.
Watters & Donovan	161 William St., New York, N. Y	827	New York.
George Hoyt Whipple, Jr	University of Rochester, Post Office Box 287, Station 3, Rochester, N. Y.	822	Do.

FEB. 1 THROUGH FEB. 29, 1956

The American Laundry Machinery Co.	Ross and Section Ave., Cincinnati, Ohio.	771	Chicago.
Case Institute of Technology	University Circle, Cleveland, Ohio	778	Do.
Commercial Solvents Corp	1331 South 1st St., Terre Haute, Ind	734	Do.
Continental Oil Co	Ponca City, Okla	772	Albuquerque.
Dravo Corp	Neville Island, Pittsburgh, Pa	790	Chicago.
Dunlap & Associates, Inc	429 Atlantic St., Stamford, Conn	776	New York.
Gall, Lane & Howe	401 Commonwealth Bldg., 1625 K St. NW., Washington, D. C.	782	Washington civilian application.
General Dynamics Corp	445 Park Ave., New York, N. Y	754	Albuquerque.
The Griswold-Eshleman Co	1400 Terminal Tower, Cleveland, Ohio	777	Chicago.
Harvey Machine Co., Inc	19200 South Western Ave., Torrance, Calif.	769	San Francisco.
Henry H. Hausner	730 5th Ave., New York, N. Y	763	New York.
Houston Lighting & Power Co	1016 Walker Ave. at Fannin St., Post Office Box 1700, Houston, Tex.	794	Albuquerque.
O. G. Kelley & Co	98 Taylor St., Boston, Mass	765	Schenectady.
A. M. Kinney, Inc	2905 Vernon Pl., Cincinnati, Ohio	768	Chicago.
Kuhn, Loeb & Co	30 Wall St., New York, N. Y	774	New York.

[1] Santa Fe Operations Office changed to Albuquerque Operations Office effective Apr. 2, 1956.

Access permits issued—Continued

FEB. 1 THROUGH FEB. 29, 1956—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
The Kuljian Corp	1200 North Broad St., Philadelphia, Pa.	742	New York.
Joseph G. Lundholm, Jr	1002 Nichols Dr., Raleigh, N. C	770	Chicago.
J. P. Morgan & Co., Inc	23 Wall St., New York, N. Y	799	New York.
New York Life Insurance Co	51 Madison Ave., New York, N. Y	792	Do.
Nuclear Corp	Virginia and Truckee Bldg., Carson City, Nev.	767	San Francisco.
The Pure Oil Co	35 East Wacker Dr., Chicago, Ill	796	Chicago.
William W. Steele, Jr	717 Peoples Bank Bldg., Canton, Ohio.	773	Do.
Sullivan & Cromwell	48 Wall St., New York, N. Y	781	New York.
Taylor Forge & Pipe Works, Inc	Post Office Box 485, Chicago, Ill	788	Chicago.
Tennessee Valley Authority	Chattanooga, Tenn	779	Oak Ridge.
Tranter Manufacturing, Inc	735 East Hasel St., Lansing, Mich	802	Chicago.
Union Engineering Corp	315 1st St., Hoboken, N. J	787	New York.
D. Van Nostrand Co., Inc	120 Alexander St., Princeton, N. J	783	Do.

JAN. 1 THROUGH Jan. 31, 1956

Aeroprojects Inc	310 East Rosedale Ave., West Chester, Pa.	700	New York.
American Cyanamid Co	30 Rockefeller Plaza, New York, N. Y.	718	Do.
The American Society of Mechanical Engineers for the Boiler and Pressure Vessel Committee, Special Committee on Nuclear Power.	29 West 39th St., New York, N. Y.	720	Do.
American Surety Company of New York.	100 Broadway, New York, N. Y	764	Do.
Arthur Andersen & Co	120 South LaSalle St., Chicago, Ill	683	Chicago.
Applied Science Corporation of Princeton, N. J.	Box 44, Princeton, N. J	743	New York.
Theodore Baumeister	Pupin Laboratories, Columbia University, New York, N. Y.	750	Do.
B-I-F Industries, Inc	345 Harris Ave., Providence, R. I	727	Do.
Board of Public Works, City of Beatrice.	4th and Ella St., Beatrice, Nebr	721	Chicago.
The Borden Co	Chemical Division, Post Office Box 9524, Philadelphia, Pa.	757	New York.
Howard F. Casselman	744 Broad St., Newark, N. J	728	Do.
Coley & Petersen	840 West 25th St., Norfolk, Va	755	Savannah River.
The Continental Insurance Co	80 Maiden Lane, New York, N. Y	725	New York.
Dian Laboratories, Inc	611 Broadway, New York, N. Y	704	Do.
Duncombe, Oltarsh & Schott	501 Madison Ave., New York, N. Y	738	Do.
Fansteel Metallurgical Corp	2200 Sheridan Rd., North Chicago, Ill	756	Chicago.
Fidelity and Casualty Company of New York.	80 Maiden Lane, New York, N. Y	726	New York.
Florida State Chamber of Commerce.	5th floor, Hildebrandt Bldg., Jacksonville, Fla.	730	Savannah River.
General Adjustment Bureau, Inc	99 John St., New York, N. Y	733	New York.
General Controls Co	801 Allen Ave., Glendale, Calif	766	San Francisco.
G. M. Giannini & Co., Inc	918 East Green St., Pasadena, Calif	729	Albuquerque.
The Griscom-Russel Co	225 Wetmore Ave. SE., Massillon, Ohio.	758	Chicago.
Hammond Iron Works	1420 Lexington Ave., Warren, Pa	744	Do.
The Hartford Electric Steel Corp	540 Flatbush Ave., Hartford, Conn	741	New York.
Herman Bros., Inc	1215 Farnam St., Omaha, Nebr	747	Chicago.
Hycon Manufacturing Co	2961 East Colorado St., Pasadena, Calif.	709	San Francisco.
Kaiser Aluminum & Chemical Corp.	1625 I St. NW., Washington, D. C	749	Do.
P. J. Kennedy & Co	54 Canal St., Holyoke, Mass	724	Schenectady.
Kern County Land Co	600 California St., San Francisco, Calif	712	San Francisco.
Robert Lincoln Loofbourow	4032 Queen Ave. South, Minneapolis, Minn.	715	Chicago.
Lutz & May Co	819 Finance Bldg., Kansas City, Mo	722	Albuquerque.
Minnkota Power Cooperative, Inc	Post Office Box 31, Grand Forks, N. Dak.	710	Chicago.
Molesworth Associates	260 Madison Ave., New York, N. Y	745	New York.
New York State Department of Commerce.	112 State St., Albany, N. Y	752	Schenectady.
Newport News Shipbuilding & Dry Dock Co.	4101 Washington Ave., Newport News, Va.	706	Chicago.
Nuclear Reactors, Inc	30 Memorial Dr., Cambridge 42, Mass	713	Schenectady.
Pennsylvania Uranium Corp	35 South 6th St., Reading, Pa	716	New York.
Plains Electric Generation & Transmission Cooperative, Inc.	915 Copper NE., Albuquerque, N. Mex.	748	Albuquerque.
Public Service Company of New Mexico.	424 Central Ave. SW., Albuquerque, N. Mex.	753	Do.

Access permits issued—Continued

JAN. 1 THROUGH JAN. 31, 1956—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
Purolator Products, Inc	970 New Brunswick Ave., Rahway, N. J.	664	New York.
Quantum, Inc	756 North Brooksvale Rd., Cheshire, Conn.	711	Do.
Rare Earths, Inc	Box 488, Pompton Plains, N. J	759	Do.
Rare Metals Corporation of America	10th floor, First Security Bldg., Salt Lake City, Utah.	714	Grand Junction.
Reading Anthracite Co	200 Mahantongo St., Pottsville, Pa	731	New York.
Reliance Electric & Engineering Co	1088 Ivanhoe Rd., Cleveland, Ohio	717	Chicago.
Wilburn Caroll Schroeder	Department of Chemical Engineering, University of Maryland, College Park, Md.	659	Washington civilian application.
Servomechanisms, Inc	12500 Aviation Blvd., Hawthorne, Calif.	719	Albuquerque.
Sorensen & Co., Inc	375 Fairfield Ave., Stamford, Conn	762	New York.
Standard Ore & Alloys Corp	120 Wall St., New York, N. Y	740	Do.
Standard Railway Equipment Manufacturing Co.	4527 Columbia Ave., Hammond, Ind	736	Chicago.
United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada.	Suite 502, Ring Bldg., Washington, D. C.	708	Washington civilian application.
The United Illuminating Co	80 Temple St., New Haven, Conn	737	New York.
Universal Atomics Corp	19 East 48th St., New York, N. Y	761	Do.
Uranium Reduction Co	557 First Security Bldg., Salt Lake City, Utah.	723	Grand Junction.
Vanadium Corporation of America	420 Lexington Ave., New York, N. Y	739	New York.
S. L. Westerman Corp	116 John St., New York, N. Y	746	Do.
White, Weld & Co	40 Wall St., New York, N. Y	735	Do.
Wisconsin-Michigan Power Co	807 South Oneida St., Appleton, Wis	751	Chicago.
Woodbury Clay Co	403 Allegheny St., Hollidaysburg, Pa	732	New York.

Cumulative list of access permits issued through Dec. 31, 1955

Permit holder	Address	Permit No.	AEC office implementing permit
Abbott Laboratories	North Chicago, Ill	324	Oak Ridge.
Adams Engineering Co., Inc	Post Office Box 936, Little River Branch, Miami, Fla.	130	Savannah River.
Advanced Scientific Techniques Research Associates (ASTRA).	Post Office Box 163, Milford, Conn	621	New York.
Aerojet-General Corp	6352 North Irwindale Ave., Azusa, Calif.	649	San Francisco.
The Aetna Casualty & Surety Co	151 Farmington Ave., Hartford, Conn	464	New York.
Air Preheater Corp	60 East 42d St., New York, N. Y	140	Do.
Air Products, Inc	Post Office Box 538, Allentown, Pa	117	Do.
Alabama Power Co	600 North 18th St., Birmingham, Ala	445	Savannah River.
Alcar Instruments, Inc	17 Industrial Ave., Little Ferry, N. J	222	New York.
Alco Products, Inc	Schenectady, N. Y	605	Schenectady.
Alexander & Alexander, Inc	225 Broadway, New York, N. Y	531	New York.
W. A. Alexander & Co	135 South La Salle St., Chicago, Ill	358	Chicago.
Allied Chemical & Dye Corp	61 Broadway, New York, N. Y	261	New York.
Allis-Chalmers Manufacturing Co.	Box 512, Milwaukee, Wis	618	Chicago.
Alloy Precision Castings Co	East 45th St. and Hamilton Ave., Cleveland, Ohio.	609	Do.
Alpha Metals, Inc	56 Water St., Jersey City, N. J	507	New York.
Aluminum Company of America	1501 Alcoa Bldg., Pittsburgh, Pa	634	Oak Ridge.
American & Foreign Enterprises, Ind.	521 5th Ave., New York, N. Y	186	New York.
American & Foreign Power Co., Inc	2 Rector St., New York, N. Y	674	Do.
American Gas & Electric Service Corp.	30 Church St., New York, N. Y	553	Chicago.
American Lava Corp	Cherokee Blvd. and Manufacturing Rd., Chattanooga, Tenn.	411	Oak Ridge.
American Machine & Foundry Co.	261 Madison Ave., New York, N. Y	281	Schenectady.
The American Metal Co., Ltd	61 Broadway, New York, N. Y	185	New York, N. Y.
American Mutual Liability Insurance Co.	Post Office Box 103, Boston, Mass	137	Schenectady.
American Oil Company (Texas)	Research and Development Department, Texas City, Tex.	589	Albuquerque.
American Potash & Chemical Corp	3030 West 6th St., Los Angeles, Calif	209	San Francisco.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
American Public Power Association	1757 K St. NW., Washington, D. C.	479	Washington civilian application.
American Radiator & Standard Sanitary Corp.	1682 Broadway, New York, N. Y.	106	San Francisco.
American Smelting & Refining Co	Central Research Laboratories, South Plainfield, N. J.	577	New York.
American Zinc, Lead & Smelting	1600 Paul Brown Bldg., St Louis, Mo.	701	Oak Ridge.
The Anaconda Co	25 Broadway, New York, N. Y.	615	New York.
Anchor Hocking Glass Corp	Lancaster, Ohio	332	Chicago.
City of Anchorage, Alaska	Post Office Box 400, Anchorage, Alaska	685	Hanford.
The Anderson Physical Laboratory	609 South 6th St., Champaign, Ill.	600	Chicago.
Anton Electronic Laboratories, Inc.	1226 Flushing Ave., Brooklyn, N. Y.	513	New York.
Applied Radiation Corp	1210 Springbrook Rd., Walnut Creek, Calif.	590	San Francisco.
Arde Associates	14 William St., Newark, N. J.	519	New York.
Arizona Public Service Co	501 South 3d Ave., Phoenix, Ariz.	598	Idaho.
Arma Division, American Bosch Arma Corp.	Roosevelt Field, Garden City, N. Y.	607	New York.
Armstrong Cork Co	Lancaster, Pa.	194	Do.
Atlantic City Electric Co	1600 Pacific Ave., Atlantic City, N. J.	469	Do.
The Atlantic Refining Co	260 South Broad St., Philadelphia, Pa.	225	Oak Ridge.
Atlantic Research Corp	901 North Columbus St., Alexandria, Va.	190	Washington civilian application.
Atlas Powder Co	Wilmington, Del.	645	New York.
Atomic Development Mutual Fund, Inc.	1033 30th St, NW., Washington, D. C.	206	Washington civilian application.
Atomic Industrial Forum, Inc	260 Madison Ave., New York, N. Y.	188	New York.
Atomic Power Development Associates, Inc.	2000 2d Ave., Detroit, Mich.	169	Chicago.
The Austin Co	16112 Euclid Ave., Cleveland, Ohio	369	Do.
The Babcock & Wilcox Co	161 East 42d St., New York, N. Y.	239	New York.
Bailey Meter Co	1050 Ivanhoe Rd., Cleveland, Ohio	350	Chicago.
Baker & Co., Inc.	113 Astor St., Newark, N. J.	110	New York.
J. T. Baker Chemical Co	600 North Broad St., Phillipsburg, N. J.	417	Do.
Baker Graphic Service, Inc	437 Emerson St., Palo Alto, Calif.	437	San Francisco.
Baldwin-Lima-Hamilton Corp	Eddystone Division, Philadelphia, Pa.	287	New York.
R. Maxil Ballinger	145 East 49th St., New York, N. Y.	696	Do.
Baltimore Gas & Electric Co	Lexington Bldg., Lexington and Liberty Sts., Baltimore, Md.	493	Washington civilian application.
Bankers Trust Co	16 Wall St., New York, N. Y.	367	New York.
Bart Manufacturing Corp	227 Main St., Belleville, N. J.	642	Do.
Bath Iron Works Corp	Bath, Maine	179	Do.
Battelle Memorial Institute	505 King Ave., Columbus, Ohio	279	Chicago.
Bayles, Hollenbeck & Co	522 5th Ave., New York, N. Y.	238	New York.
Irving Bazell	1204 Russ Bldg., Montgomery St., San Francisco, Calif.	699	San Francisco.
Bechtel Corp	220 Bush St., San Francisco, Calif.	557	Chicago.
Behlen Manufacturing Co	Columbus, Nebr.	599	Do.
Bell & Howell Co	7100 McCormick Rd., Chicago, Ill.	665	Do.
Belock Instrument Corp	111-01 14th Ave., College Point, N. Y.	651	New York.
Belt & Ricker	330 South Wells St., Chicago, Ill.	478	Chicago.
Bendix Aviation Corp., Research Laboratories Division.	1104 Fisher Bldg., Detroit, Mich.	286	Do.
Julius Frederick Thomas Berliner	2710 South Parkway, Chicago, Ill.	533	Do.
The Beryllium Corp	Post Office Box 1462, Reading, Pa.	585	New York.
Bethlehem Steel Co	Shipbuilding Division, Quincy, Mass.	420	Schenectady.
Bishop & Hedgerg, Inc	1500 Walnut St., Philadelphia, Pa.	362	New York.
Black & Veatch	4706 Broadway, Kansas City, Mo.	246	Albuquerque.
Blaw-Knox Co., Chemical Plants Division.	930 Fort Duquesne Blvd., Pittsburgh, Pa.	248	Chicago.
Charles F. Bonilla	Columbia University, New York, N. Y.	351	New York.
Booz, Allen & Hamilton	135 South La Salle St., Chicago, Ill.	608	Chicago.
Borg-Warner Corp	310 South Michigan Ave., Chicago, Ill.	326	Do.
Boston Edison Co	182 Tremont St., Boston, Mass.	275	Schenectady.
Bozell & Jacobs, Inc	711 14th St. NW., Washington, D. C.	212	Washington civilian application.
C. F. Braun	1000 South Fremont Ave., Alhambra, Calif.	527	San Francisco.
Brent & Co	135 South La Salle St., Chicago, Ill.	397	Chicago.
The Bristol Co	Waterbury, Conn.	707	New York.
Broadview Research & Development.	Post Office Box 1093, Burlingame, Calif.	453	San Francisco.
Brooks & Perkins, Inc	1950 West Fort St., Detroit, Mich.	233	Chicago.
Weldon G. Brown	5747 Ellis Ave., University of Chicago, Chicago, Ill.	680	Do.
Brown, Crosby & Co., Inc	96 Wall St., New York, N. Y.	165	New York.
The Budd Co.	2450 Hunting Park Ave., Philadelphia, Pa.	413	Do.
The University of Buffalo	Buffalo, N. Y.	125	Do.
Bulova Research & Development Laboratories, Inc.	Bulova Park, Flushing, N. Y.	232	Do.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
City of Burbank Public Service Department.	164 West Magnolia Blvd., Burbank, Calif.	496	San Francisco.
Burns & Roe, Inc	233 Broadway, New York, N. Y	118	New York.
Burroughs Corp	6071 2d Ave., Detroit, Mich	687	Chicago.
The Bush Manufacturing Co	West Hartford, Conn	546	New York.
Business Atomics Publications, Inc	1700 York Ave., New York, N. Y	655	Do.
Caldwell-Clements, Inc	480 Lexington Ave., New York, N. Y	501	Do.
Cambridge Applied Research, Inc	60 White St., Belmont, Mass	336	Schenectady.
Cambridge Electric Light Co	727 Massachusetts Ave., Cambridge, Mass.	628	Do.
The Carborundum Co	Buffalo Ave., Niagara Falls, N. Y	347	Do.
Carolina Power & Light	336 Fayetteville St., Raleigh, N. C	199	Savannah River.
Carpco Research & Engineering	Post Office Box 3272, Jacksonville, Fla.	439	Do.
Carrier Corp	300 South Geddes St., Syracuse, N. Y	641	Schenectady.
Catalytic Construction Co	1528 Walnut St., Philadelphia, Pa	105	New York.
CBS-Hytron, division of Columbia Broadcasting System, Inc.	100 Endicott St., Danvers, Mass	197	Schenectady.
C-D Protection Shelters	606 Calle De Arboles, Redondo Beach, Calif.	502	San Francisco.
Central and South West Corp	20 North Wacker Dr., Chicago, Ill	323	Chicago.
Central Hudson Gas & Electric Corp.	South Rd., Poughkeepsie, N. Y	404	New York.
Central Illinois Light Co	316 South Jefferson St., Peoria, Ill	241	Chicago.
Central Illinois Public Service Co	Illinois Bldg., Springfield, Ill	245	Do.
Central Kansas Electric Cooperative, Inc.	Box 188, Great Bend, Kans	346	Albuquerque.
Central Louisiana Electric Co., Inc	Post Office Box 111, Alexandria, La	339	Chicago.
Central Maine Power Co	9 Green St., Augusta, Maine	344	Schenectady.
Central Power & Light Co	120 North Chaparral, Corpus Christi, Tex.	205	Chicago.
Central Vermont Public Service Corp.	121 West St., Rutland, Vt	259	Schenectady.
Chamber of Commerce of the United States.	1615 H St. NW., Washington, D. C	565	Washington civilian application.
The Champion Paper & Fibre Co	Hamilton, Ohio	219	Chicago.
Everett Chapman	Box 207, West Chester, Pa	689	New York.
The Chase Manhattan Bank	18 Pine St., New York, N. Y	104	Do.
Chemical Associates	Suite 510–511, Pennsylvania Bldg., 425 13th St. NW., Washington, D. C.	226	Washington civilian application.
Chemical Process Co	58 Sutter St., San Francisco Calif	349	Grand Junction.
Chicago Bridge & Iron Co	1305 West 105th St., Chicago, Ill	371	Chicago.
Chrysler Corp	Post Office Box 1919, Detroit, Mich	448	Do.
Chubb & Son	90 John St., New York, N. Y	146	New York.
The Cincinnati Gas & Electric Co	Post Office Box 960, Cincinnati, Ohio	440	Chicago.
Clark Bros. Co., division of Dresser Operations, Inc.	North 5th St., Olean, N. Y	504	New York.
David Delano Clark	Department of Engineering Physics, Rockefeller Hall, Cornell University, Ithaca, N. Y.	566	Schenectady.
Clark, Hitchcock & Associates	1115 17th St., NW., Washington, D. C	277	Washington civilian application.
The Cleveland Electric Illuminating Co.	75 Public Square, Cleveland, Ohio	431	Chicago.
The Cleveland Pneumatic Tool Co	3781 East 77th St., Cleveland, Ohio	522	Do.
Clevite Corp	17000 St. Clair Ave., Cleveland, Ohio	688	Do.
Colorado School of Mines Research Foundation, Inc.	Golden, Colo	644	Grand Junction.
Columbia-Southern Chemical Corp	1 Gateway Center, Pittsburgh, Pa	562	Chicago.
Commonwealth Associates, Inc	252 West Cortland St., Jackson, Mich	473	Do.
Commonwealth Edison Co	72 West Adams St., Chicago, Ill	554	Do.
Community Public Service Co	408 West 7th St., Fort Worth, Tex	702	Albuquerque.
The Connecticut Light & Power Co	Post Office Box 2010, Hartford, Conn	283	Schenectady.
The Connecticut Power Co	266 Pearl St., Hartford, Conn	270	Do.
Consolidated Edison Company of New York, Inc.	4 Irving Pl., New York, N. Y	269	New York.
Construction Management Corp	80 Broad St., New York, N. Y	563	Do.
Consumers Power Co	212 West Michigan Ave., Jackson, Mich.	412	Chicago.
Consumers Public Power District	Columbus, Nebr	454	Do.
Continental Equipment Co	Corapolis, Pa	305	Do.
Cook Electric Co., Cook Research Laboratories division.	8100 Monticello Ave., Skokie, Ill	116	Do.
Cooperative Power, Inc	202 North Downing St., Piqua, Ohio	547	Do.
The Cooper-Bessemer Corp	Mount Vernon, Ohio	196	Do.
Copes-Vulcan division Continental Foundry & Machine Co.	939 West 26th St., Erie, Pa	617	Do.
Corn Belt Power Cooperative	Humboldt, Iowa	294	Do.
Corning Glass Works	Corning, N. Y	470	New York.
Cosgrove & Co., Inc	345 Sansome St., San Francisco, Calif	632	San Francisco.
John S. Cotton	24 Evergreen Dr., Kentfield, Calif	647	Do.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
Cox & Weinrich	1518 K. St. NW. Washington, D. C	436	Washington civilian application.
Crane Co	4100 South Kedzie Ave., Chicago, Ill	428	Chicago.
William L. Crow Construction Co	101 Park Ave., New York, N. Y	466	New York.
Curtiss-Wright Corp., Propeller division.	Caldwell, N. J	315	Do.
Dallas Power & Light Co	1506 Commerce St., Dallas, Tex	382	Albuquerque.
Damascus Tube Co	Greenville, Pa	157	Chicago.
Day & Zimmerman, Inc	1700 Sanson St., Philadelphia, Pa	136	New York.
Daystrom Instrument division of Daystrom, Inc.	Archbald, Pa	159	Do.
Denham & Co., Inc	925 Book Bldg., Detroit, Mich	237	Chicago.
Denver Research Institute of the University of Denver.	University Park campus, Denver, Colo.	677	Albuquerque.
Denver & Rio Grande Western RR. Co.	1531 Stout St., Denver, Colo	288	New York.
Designers for Industry, Inc	2915 Detroit Ave., Cleveland, Ohio	587	Chicago.
The Detroit Edison Co	2000 2d Ave., Detroit, Mich	457	Do.
Detroit Insurance Agency	502 Fisher Bldg., Detroit, Mich	383	Do.
G. C. Dewey & Co., Inc	19 West 44th St., New York, N. Y	675	New York.
Donovan Construction Co	1725 Carroll Ave., St. Paul, Minn	635	Chicago.
Dorr-Oliver, Inc	Barry Pl., Stamford, Conn	370	New York.
The Dow Chemical Co	Midland, Mich	160	Chicago.
Dresser Manufacturing division, Dresser Industries, Inc.	41 Fisher Ave., Bradford, Pa	483	New York.
Wilbur B. Driver Co	1875 McCarter Highway, Newark, N. J.	234	Do.
Driver-Harris Co	201 Middlesex St., Harrison, N. J	672	Do.
Dick Duffey	Department of chemical engineering, University of Maryland College Park, Md.	314	Washington civilian application.
Duke Power Co	Charlotte, N. C	108	Savannah River.
The Eagle-Picher Co	American Bldg., Cincinnati, Ohio	143	Chicago.
Elliott Earl	Manchester Green, Box 211, Manchester, Conn.	135	New York.
Eastern Utilities Associates	49 Federal St., Boston, Mass	258	Schenectady.
Ebasco International Corp	2 Rector St., New York, N. Y	306	New York.
Ebasco Services, Inc	do	162	Do.
F. Eberstadt & Co	39 Broadway, New York, N. Y	395	Do.
Thomas A. Edison, Inc., instruments division.	Lakeside Ave., West Orange, N. J	366	Do.
Efficient Engineering Co., Inc	23680 Coolidge Highway, Detroit, Mich.	477	Chicago.
Ellerbe & Co., Inc	East 505 First National Bank Bldg., St. Paul, Minn.	594	Do.
Ellis, Smith & Co	109 Thomas Bldg., Dallas, Tex	545	Albuquerque.
El-Tronics, Inc	1420 Walnut St., Philadelphia Pa	452	New York.
The Empire District Electric Co	602 Joplin St., Joplin Mo	381	Albuquerque.
Employers Mutual Liability Insurance Company of Wisconsin.	407 Grant St., Wausau, Wis	335	Chicago.
Erie Foundry Co	1253 West 12th St., Erie, Pa	517	Do.
Esso Research & Engineering Co	Post Office Box 51, Linden, N. J	303	New York.
Ethyl Corp	Post Office Box 341, Baton Rouge, La	141	Oak Ridge.
Fairchild Camera & Instrument Corp., reconnaissance systems division.	Robbins Lane, Syosset, Long Island, N. Y.	616	New York.
Federal Reserve Bank of Boston	30 Pearl St., Boston, Mass	580	Schenectady.
International Telephone & Telegraph Corp.	67 Broad St., New York, N. Y	534	Chicago.
Fenwal, Inc	Ashland, Mass	292	Schenectady.
Ferro Corp	4150 East 56th St., Cleveland, Ohio	309	Chicago.
The Firestone Tire & Rubber Co	1200 Firestone Parkway, Akron, Ohio	480	Do.
The First National City Bank of New York.	55 Wall St., New York, N. Y	214	New York.
Flexonics Corp	1315 South 3d Ave., Maywood, Ill.	450	Chicago.
Flight Refueling, Inc	Friendship International Airport, Baltimore, Md.	236	Oak Ridge.
Florida Power & Light Co	Miami, Fla	112	Savannah River.
Florida Power Corp	Florida Power Bldg., St. Petersburg, Fla.	109	Do.
Engineering & Industrial Experiment Station, University of Florida.	Gainesville, Fla	139	Do.
The Fluor Corp., Ltd	2500 South Atlantic Blvd., Los Angeles, Calif.	516	San Francisco.
Food Machinery & Chemical Corp.	1105 Coleman Ave., San Jose, Calif	274	Oak Ridge.
Foote Mineral Co	18 West Chelton Ave., Philadelphia, Pa.	345	New York.
Ford, Bacon & David, Inc	39 Broadway, New York, N. Y	297	Do.
Foster Wheeler Corp	165 Broadway, New York, N. Y	583	Do.
The Foxboro Co	38 Neponset Ave., Foxboro, Mass	354	Do.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
Francisco & Jacobus	511 Fifth Ave., New York, N. Y	548	New York.
The Franklin Institute of the State of Pennsylvania.	Philadelphia, Pa	252	Do.
Friede & Goldman, Inc	1420 National Bank of Commerce Bldg., New Orleans, La.	111	Oak Ridge.
The Garrett Corp	9851–9951 Sepulveda Blvd., Los Angeles, Calif.	426	San Francisco.
General Ceramics Corp	Keasbey, N. J	289	New York.
General Communication Co	677 Beacon St., Boston, Mass	705	Schenectady.
General Electric Co	1 River Rd., Schenectady, N. Y	280	Do.
General Mills, Inc	400 Second Ave. South, Minneapolis, Minn.	217	Chicago.
General Motors Corp	3044 West Grand Blvd., Detroit, Mich	489	Do.
General Precision Equipment Corp	92 Gold St., New York, N. Y	204	New York.
General Public Utilities Corp	67 Broad St., New York, N. Y	240	Do.
General Steel Castings Corp	1417 State St., Granite City, Ill	147	Oak Ridge.
Georgia Power Co	Post Office Box 1719, Atlanta, Ga	449	Savannah River.
Gibbs & Cox, Inc	1 Broadway, New York, N. Y	167	New York.
Gibbs & Hill, Inc	Pennsylvania Station, New York, N. Y.	113	Do.
Giffels & Vallet, Inc	1000 Marquette Bldg., Detroit, Mich	528	Chicago.
Gilbert Associates, Inc	1417 K St. NW., Washington, D. C	322	New York.
Gladding, McBean & Co	2901 Los Felis Blvd., Los Angeles, Calif.	653	San Francisco.
City of Glendale public service department.	119 North Glendale Ave., Glendale, Calif.	342	Do.
Henry J. Gomberg	2036 Phoenix Memorial Laboratory, North Campus, University of Michigan, Ann Arbor, Mich.	568	Chicago.
The B. F. Goodrich Co	500 South Main St., Arkon, Ohio	438	Do.
The Goodyear Tire & Rubber Co	1144 East Market St., Akron, Ohio	461	Do.
Robert Morton Gould	15 Wellington Rd., Livingston, N. J	624	New York.
W. R. Grace & Co	101 North Charles St., Baltimore, Md	176	Oak Ridge.
Graflex, Inc	154 Clarissa St., Rochester, N. Y	304	Schenectady.
Graver Tank & Manufacturing	4809 Tod Ave., East Chicago, Ind	331	Chicago.
Great Lakes Carbon Corp	18 East 48th St., New York, N. Y	299	Do.
A. P. Green Fire Brick Co	1018 East Breckenridge, Mexico, Mo	379	Do.
Greenwood County Electric Power Commission.	Chappells, S. C	638	Savannah River.
Greer Hydraulics, Inc	New York International Airport, Jamaica, N. Y.	514	New York.
Kenneth F. Griffiths	671 Broad St., Newark, N. J	221	Do.
Guaranty Trust Company of New York.	140 Broadway, New York, N. Y	490	Do.
Gulf Power Co	8–10 North Palafox St., Pensacola, Fla	443	Savannah River.
Gulf Research & Development Co	Post office Drawer 2038, Pittsburgh 30, Pa.	164	Chicago.
Frank B. Hall & Co., Inc	67 Wall St., New York, N. Y	455	New York.
Harbison-Walker Refractories Co	1800 Farmers Bank Bldg., Pittsburgh, Pa.	257	Chicago.
The Harshaw Chemical Co	1945 East 97th St., Cleveland, Ohio	523	Oak Ridge.
John J. Harte Co	284 Techwood Dr. NW., Atlanta, Ga	216	Savannah River.
The Hartford Electric Light Co	266 Pearl St., Hartford, Conn	271	Schnectady.
The Hartford Steam Boiler Inspection & Insurance Co.	56 Prospect St., Hartford, Conn	364	New York.
The Hawaiian Electric Co., Ltd	Box 2750, Honolulu, T. H	102	San Francisco.
Haywood Publishing Co	22 East Huron St., Chicago, Ill	229	Chicago.
Hazleton Laboratories, Inc	Box 333, Falls Church, Va	626	Washington civilian application.
Howard H. Heilman	609 South Grand Ave., Room 1011, Los Angeles, Calif.	601	San Francisco.
Hercules Powder Co	Delaware Trust Bldg., 902 Market St., Wilmington Del.	276	New York.
J. Edward Hibline Co., Inc	Mercantile Trust Bldg, Baltimore, Md.	396	Washington Civilian application.
Hills-McCanna Co	3025 North Western Ave., Chicago, Ill	660	Chicago.
Holley Carburetor Co	11955 East Nine Mile Rd., Van Dyke, Mich.	652	Do.
City of Holyoke Gas & Electric Department.	70 Suffolk St., Holyoke, Mass	578	Schenectady.
Holyoke Water Power Co	1 Canal St., Holyoke, Mass	691	Do.
The Home Insurance Co	59 Maiden Lane, New York, N. Y	569	New York.
The O. Hommel Co	Post office box 475, Pittsburgh, Pa	603	Chicago.
Horizons, Inc	90 Nassau St., Princeton, N. J	658	Do.
Houdry Process Corp	1528 Walnut St., Philadelphia, Pa	267	New York.
Hughes Aircraft Co	Florence and Teale Sts., Culver City, Calif.	684	San Francisco.
Humble Oil & Refining Co	Humble Bldg., 1216 Main St., Houston, Tex.	581	Albuquerque.
Hydrocarbon Research, Inc	115 Broadway, New York, N. Y	432	New York.
Idaho Power Co	1220 Idaho St., Boise, Idaho	535	Idaho.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
Illinois Power Co	134 East Main St., Decatur, Ill	120	Chicago.
Illinois Water Treatment	840 Cedar St., Rockford, Ill	374	Do.
Indianapolis Power & Light Co	25 Monument Circle, Indianapolis, Ind.	495	Do.
The Ingalls Shipbuilding Corp	Pascagoula, Miss	203	Oak Ridge.
Ingersoll-Rand Co	1627 K St. NW., Washington, D. C	170	New York.
Insurance Company of North America.	1600 Arch St., Philadelphia, Pa	499	Do.
International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers, and Helpers.	New Brotherhood Bldg., Kansas City, Kans.	180	Albuquerque.
International Harvester Co	180 North Michigan Ave., Chicago, Ill	133	Chicago.
Internuclear Co	7 North Brentwood Blvd., Clayton, Mo.	670	Do.
Interstate Power Co	1000 Main St., Dubuque, Iowa	175	Do.
Ionics, Inc	152 6th St., Cambridge, Mass	539	Schenectady.
Iowa Electric Light & Power Co	Cedar Rapids, Iowa	202	Chicago.
Iowa-Illinois Gas & Electric Co	Davenport, Iowa	195	Do.
Iowa Power & Light Co	823 Walnut St., Des Moines, Iowa	161	Do.
Iowa Public Service Co	Orpheum-Electric Bldg., Sioux City, Iowa.	210	Do.
Iowa Southern Utilities Co	317 North 13th St., Centerville, Iowa	201	Do.
Jackson & Church Co	321 North Hamilton St., Saginaw, Mich.	505	Do.
Jackson & Moreland	600 Park Square Bldg., Boston, Mass	459	New York.
Jersey Central Power & Light Co	501 Grand Ave., Asbury Park, N. J	320	Do.
Jessop Steel Co	500 Green St., Washington, Pa	243	Chicago.
Corydon M. Johnson Co., Inc	Bethpage, Long Island, New York, N. Y.	686	New York.
Mead Johnson & Co	Evansville, Ind	384	Chicago.
Johnson & Higgins of California	311 California St., San Francisco, Calif.	278	San Francisco.
Johnson Service Co	507 East Michigan St., Milwaukee, Wis.	570	Chicago.
William B. Johnson & Associates, Inc.	Empire State Bldg., New York, N. Y	604	New York.
Kaiser Engineers, division of Henry J. Kaiser Co.	1924 Broadway, Oakland, Calif	424	San Francisco.
Kalb, Voorhis & Co	25 Broad St., New York, N. Y	606	New York.
Kansas City Power & Light Co	1330 Baltimore Ave., Kansas City, Mo.	242	Chicago.
Kansas Electric Cooperatives	Room 406, Crawford Bldg., 5th and Jackson, Topeka, Kans.	154	Albuquerque.
Kansas Gas & Electric Co	120 East 1st St., Wichita, Kans	434	Chicago.
The Kansas Power & Light Co	800 Kansas Ave., Topeka, Kans	416	Do.
Kawecki Chemical Co	Boyertown, Pa	408	New York.
The Kaydon Engineering Corp	Muskegon, Mich	498	Chicago.
Kentucky Utilities Co	120 South Limestone St., Lexington, Ky.	174	Do.
Kerr & Co	521 Forest Ave., Laguna Beach, Calif	482	San Francisco.
Kerr-McGee Oil Industries, Inc	Kerr-McGee Bldg., Oklahoma City, Okla.	650	Grand Junction.
Walter Kidde Nuclear Laboratories, Inc.	975 Stewart Ave., Garden City, N. Y	579	New York.
Peter Kiewit Sons' Co	1024 Omaha National Bank Bldg., Omaha, Nebr.	657	Oak Ridge.
Knowles Associates	19 Rector St., New York, N. Y	451	New York.
Kollmorgen Optical Corp	347 King St., Northampton, Mass	145	Schenectady.
Koppers Co., Inc	Nuclear Products Section, Production Department, Pittsburgh, Pa.	103	Chicago.
William M. Kunstler	511 5th Ave., New York, N. Y	573	New York.
Laboratory Corporation of America	4404 Bellevue Ave., Detroit, Mich	471	Chicago.
Lead Industries Association	420 Lexington Ave., New York, N. Y	676	New York.
Lester D. Lee	300 Lincoln Bldg., Minneapolis, Minn	456	Chicago.
Leeds & Northrup Co	4901 Stenton Ave., Philadelphia, Pa	586	New York.
Franklin J. Leerburger	250 East 43d St., New York, N. Y	560	Do.
Liberty Mutual Insurance Co	175 Berkeley St., Boston, Mass	149	Schenectady.
Librascope, Inc	808 Western Ave., Glendale, Calif	667	San Francisco.
Lindsay Chemical Co	West Chicago, Ill	119	Chicago.
Link Aviation, Inc	Hillcrest, Binghamton, N. Y	340	Schenectady.
Arthur Linz	551 5th Ave., New York, N. Y	690	New York.
Lithium Corporation of America, Inc.	Rand Tower, Minneapolis, Minn	435	Chicago.
Arthur D. Little, Inc	30 Memorial Dr., Cambridge, Mass	611	Schnectady.
Litton Industries, Inc	336 North Foothill Rd., Beverly Hills, Calif.	361	San Francisco.
Long Island Lighting Co	250 Old Country Rd., Mineola, N. Y	508	New York.
The City of Los Angeles Department of Water and Power.	207 South Broadway, Box 3669, Terminal Annex, Los Angeles, Calif.	352	San Francisco.
Lloyd F. Lucks	24 Evergreen Dr., Kentfield, Calif	648	Do.
Lukens Steel Co	Coatesville, Pa	156	New York.
Lumbermen's Mutual Casualty Co	Chicago, Ill	530	Chicago.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
The Lummus Co	385 Madison Ave., New York, N. Y	472	New York.
Lynchburg Foundry Co	Lynchburg, Va	107	Oak Ridge.
McGraw-Hill Publishing Co., Inc	330 West 42d St., New York, N. Y	142	New York.
E. P. McLean Engineering Co	815 South Main St., Moultrie, Ga	623	Savannah River.
Magnetic Amplifiers, Inc	632 Tinton Ave., New York, N. Y	295	New York.
Magnolia Petroleum Co	Post Office Box 900, Dallas, Tex	419	Albuquerque.
Robert Fulton Maine	1420 Walnut St., Philadelphia, Pa	285	New York.
Mallinckrodt Chemical Works	3600 North 2d St., St. Louis, Mo	409	Oak Ridge.
P. R. Mallory & Co., Inc	Indianapolis, Ind	254	Chicago.
Manganese Corporation of Arizona	Post Office Box 622, Socorro, N. Mex	372	Albuquerque.
Manning, Maxwell & Moore, Inc	250 East Main St., Stratford, Conn	207	New York.
Manu-Mine Research & Development Co.	Post Office Box 167, Reading, Pa	360	Do.
Marinette Marine Corp	Ely St., Marinette, Wis	698	Chicago.
Maritime Administration of the U. S. Department of Commerce.	Washington, D. C	(1)	Washington reactor development.
Markite Co	155 Waverly Pl., New York, N. Y	682	New York.
Marsh & McLennan, Inc	70 Pine St., New York, N. Y	131	Do.
James C. Marshall	62 West 47th St., New York, N. Y	375	Do.
The Glenn L. Martin Co	Baltimore, Md	302	Chicago.
Maryland Casualty Co	Box 1228, Baltimore, Md	410	Washington civilian application.
Maryland Shipbuilding & Drydock Co.	Post Office Box 537, Baltimore, Md	679	Do.
Massachusetts Department of Public Utilities.	State House, Boston, Mass	193	Schenectady.
Massachusetts Institute of Technology.	77 Massachusetts Ave., Cambridge, Mass.	325	New York.
Massachusetts Investors Trust	200 Berkeley St., Boston, Mass	575	Schenectady.
Maxon Construction Co., Inc	2600 Far Hills Ave., Dayton, Ohio	654	Chicago.
Meldrum & Fewsmith, Inc	1220 Huron Rd., Cleveland, Ohio	518	Do.
T. Mellon & Sons	525 William Penn Pl., Pittsburgh, Pa	268	Do.
Mellon-Stuart Co	210 East Parkway, Pittsburgh, Pa	273	Do.
Merrill Lynch, Pierce, Fenner & Beane.	70 Pine St., New York, N. Y	132	New York.
Metal & Thermit Corp	100 East 42d St., New York, N. Y	640	Do.
Metals & Controls Corp. general plate division.	34 Forest St., Attleboro, Mass	503	Schenectady.
Metropolitan Edison Co	Post Office Box 542, Reading, Pa	318	New York.
University of Miami	Coral Gables, Fla	630	Savannah River.
Michigan Chemical Corp	St. Louis, Mich	596	Chicago.
The Regents of the University of Michigan.	Ann Arbor, Mich	610	Do.
Mid-Century Instrumatic Corp	611 Broadway, New York, N. Y	363	New York.
Middle South Utilities, Inc	2 Rector St., New York, N. Y	155	Do.
Middle West Service Co	20 North Wacker Dr., Chicago, Ill	353	Chicago.
Midwest Research Institute	425 Volker Blvd., Kansas City, Mo	476	Albuquerque.
Francis T. Miles	Brookhaven National Laboratory, Upton, Long Island, N. Y.	334	Chicago.
Mine Safety Appliances Co	201 North Braddock Ave., Pittsburgh, Pa.	343	Do.
Minneapolis-Honeywell Regulator Co.	2753 4th Ave. South, Minneapolis, Minn.	500	New York.
Minnesota Mining & Manufacturing Co.	900 Fauquier Ave., St. Paul, Minn	211	Chicago.
Mississippi Power Co	2500 14th St., Gulfport, Miss	430	Savannah River.
Monongahela Power Co	1310 Fairmont Ave., Fairmont, W. Va.	387	Chicago.
Monsanto Chemical Co	St. Louis, Mo	465	Do.
The Montana Power Co	40 East Broadway, Butte, Mont	695	Idaho.
Mutual Boiler & Machinery Insurance Co.	60 Batterymarch St., Boston, Mass	200	Schenectady.
National Lead Co	111 Broadway, New York, N. Y	266	New York.
National Northern	Technical division, National Fireworks Ordnance Corp., West Hanover, Mass.	543	Schenectady.
National Research Corp	70 Memorial Dr., Cambridge, Mass	213	New York.
National Securities & Research Corp.	120 Broadway, New York, N. Y	251	Do.
National-United States Radiator Corp.	Johnstown, Pa	378	Chicago.
NEGEA Service Corp	727 Massachusetts Ave., Cambridge, Mass.	627	Schenectady.
Arthur L. Nelson	Blanco, Tex	385	Albuquerque.
New Bedford Gas & Edison Light Co.	727 Massachusetts Ave., Cambridge, Mass.	629	Schenectady.
New England Electric System	441 Stuart St., Boston, Mass	151	Do.
New Jersey Power & Light Co	9 West Blackwell St., Dover, N. J	321	New York.
The New Jersey Zinc Co	160 Front St., New York, N. Y	463	Do.
The New York Air Brake Co	230 Park Ave., New York, N. Y	597	Do.
New York Shipbuilding Corp	Camden, N. J	138	Do.

[1] Access authorization.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
New York State Electric & Gas Corp.	62 Henry St., Binghamton, N. Y.	403	Schenectady.
New York University, College of Engineering.	181st St. and University Ave., New York, N. Y.	592	New York.
Niagara Mohawk Power Corp.	300 Erie Boulevard W., Syracuse, N. Y.	401	Do.
K. D. Nichols	1701 K St. NW., Washington, D. C.	123	Washington civilian application.
W. C. Nickum & Sons	71 Columbia St., Seattle, Wash.	153	Hanford.
Norbute Corp.	383 Madison Ave., New York, N. Y.	697	New York.
Nordberg Manufacturing Co.	Milwaukee, Wis.	134	Chicago.
North American Aviation, Inc.	Box 309, Downey, Calif.	467	San Francisco.
Northern Indiana Public Service Co.	5265 Hohman Ave., Hammond, Ind.	253	Chicago.
Nuclear Biophysics Corp.	61 Broadway, New York, N. Y.	308	New York.
Nuclear Corporation of America, Inc.	Empire State Bldg., New York, N. Y.	129	Do.
Nuclear Development Corporation of America, Inc.	5 New St., White Plains, N. Y.	407	Do.
Nuclear Division, Inc.	77 Broadway, Cambridge, Mass.	373	Schenectady.
Nuclear energy products division of ACF Industries, Inc.	30 Church St., New York, N. Y.	542	New York.
Nuclear Metals Corp.	660 17th St., Denver, Colo.	311	Grand Junction.
Nuclear Metals, Inc.	155 Massachusetts Ave., Cambridge, Mass.	510	New York.
Nuclear Power Group, Inc.	140 South Dearborn St., Chicago, Ill.	552	Chicago.
Nuclear Science & Engineering Corp.	Post Office Box 10901, Pittsburgh, Pa.	317	Do.
Ohio Rural Electric Cooperatives, Inc.	4302 Indianola Ave., Columbus, Ohio.	446	Do.
Oklahoma Statewide Electric Cooperative, Inc.	2726 North Oklahoma, Oklahoma City, Okla.	497	Albuquerque.
Olin-Mathieson Chemical Corp.	Mathieson Bldg., Baltimore, Md.	224	Schenectady.
Otter Tail Power Co.	215 South Cascade, Fergus Falls, Minn.	637	Chicago.
Owens-Corning Fiberglass Corp.	Toledo, Ohio	525	Do.
Owens-Illinois Glass Co.	Post Office Box 1035, Toledo, Ohio	178	Do.
Ozark-Mahoning Co.	Box 449, Tulsa, Okla.	613	Albuquerque.
P. & M. Tool Supply, Inc.	3327 Reading Rd., Cincinnati, Ohio	631	Chicago.
Pacific Car & Foundry Co.	Renton, Wash.	208	Hanford.
Pacific Gas & Electric Co.	245 Market St., San Francisco, Calif.	555	Chicago.
Pacific Industrial Manufacturing Co.	848 49th Ave., Oakland, Calif.	678	San Francisco.
John C. Paige & Co.	40 Broad St., Boston, Mass.	127	Schenectady.
The Parco Co., Inc.	136 Church St., New York, N. Y.	191	New York.
Parsons, Brinckerhoff, Hall & MacDonald.	51 Broadway, New York, N. Y.	694	Do.
The Ralph M. Parsons Co.	617 South Olive St., Los Angeles, Calif.	567	Albuquerque.
Patchen & Zimmerman	120½ Spring St. NW., Augusta, Ga.	625	Savannah River.
Pennsylvania Electric Co.	222 Levergood St., Johnstown, Pa.	319	New York.
Pennsylvania Power & Light Co.	901 Hamilton St., Allentown, Pa.	475	Chicago.
Pennsylvania Salt Manufacturing Co.	3 Penn Center Plaza, Philadelphia, Pa.	551	New York.
The Permutit Co.	330 West 42d St., New York, N. Y.	356	Do.
The Pfaudler Co.	1000 West Ave., Rochester, N. Y.	126	Schenectady.
Charles Pfizer & Co., Inc.	11 Bartlett St., Brooklyn, N. Y.	265	New York.
Philadelphia Electric Co.	1000 Chestnut St., Philadelphia, Pa.	509	Do.
Phillips Petroleum Co.	Bartlesville, Okla.	582	Idaho.
Pickard E. Warren Associates	1518 K St. NW., Washington, D. C.	447	Washington civilian application.
The Pittsburgh Piping & Equipment Co.	158 49th St., Pittsburgh, Pa.	458	Chicago.
City of Piqua, Ohio, municipal power plant.	919 South Main St., Piqua, Ohio	537	Do.
Pittsburgh Consolidation Coal Co.	2000 Koppers Bldg., Pittsburgh, Pa.	312	Do.
Positel Engineering Co.	6046 College Ave., Oakland 11, Calif.	491	San Francisco.
The Potomac Edison Co.	200 East Patrick St., Frederick, Md.	388	Chicago.
Potomac Electric Power Co.	929 E St. NW., Washington, D. C.	406	Washington civilian application.
Power Reactor Development Co.	1100 Dime Bldg., Detroit, Mich.	662	Chicago.
Henry Pratt Co.	2222 South Halsted St., Chicago, Ill.	536	Do.
Precision Tool & Manufacturing Co., Inc.	22-28 Cherry St., Westfield, Mass.	668	Schenectady.
J. F. Prichard & Co.	4625 Roanoke Parkway, Kansas City, Mo.	521	Albuquerque.
The Prosperity Co., Inc.	Syracuse, N. Y.	399	Schenectady.
Public Service Company of Colorado.	900 15th St., Denver, Colo.	540	Idaho.
Public Service Company of Indiana, Inc.	1000 East Main St., Plainfield, Ind.	173	Chicago.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
Public Service Company of New Hampshire.	Manchester, N. H	263	Schenectady.
Public Service Company of Oklahoma.	Box 201, Tulsa, Okla	247	Albuquerque.
Public Service Electric & Gas Co	80 Park Pl., Newark, N. J	468	New York.
Public Utility District No. 1 of Chelan County.	Post Office Box 1231, Wenatchee, Wash.	487	Hanford.
Public Utility District No. 1 of Snohomish County.	Post Office Box 1007, Everett, Wash	488	Do.
Puerto Rico Water Resources Authority.	Post Office Box 4267, San Juan, P. R	301	New York.
Puget Sound Power & Light Co	860 Stuart Bldg., Seattle, Wash	486	Hanford.
Radiation Applications, Inc	342 Madison Ave., New York N. Y	337	New York.
Radiation Research Corp	140 East 59th St., New York, N. Y	529	Do.
Radio Corporation of America	Front and Cooper Sts., Camden, N. J	462	Do.
Waldo Rall	40 Apple St., Wallingford, Conn	307	Do.
The Ramo-Wooldridge Corp	8820 Bellanca Ave., Los Angeles, Calif	588	San Francisco.
Rand Development Corp	13600 Deise Ave., Cleveland, Ohio	474	Chicago.
Rayalarm, Inc	546 West Lake St , Chicago, Ill	150	Do.
Raytheon Manufacturing Co	Waltham, Mass	121	New York.
Reaction Motors, Inc	Ford Rd., Denville, N. J	584	D
Reeves Instrument Corp	215 East 91st St., New York, N. Y	602	Do.
Reid & Priest	2 Rector St., New York, N. Y	666	Do.
Rem-Cru Titanium, Inc	Midland Ave., Midland, Pa	572	Chicago.
Republic Aviation Corp	Farmingdale, N. Y	520	New York.
Research Laboratories of Colorado, Inc.	Post Office Box 307, Newtown, Ohio	620	Chicago.
R. J. Reynolds Tobacco Co	4th and Main St., Winston-Salem, N. C.	526	Savannah River.
Riley Stoker Corp	9 Neponset St., Worcester, Mass	574	Idaho.
Robertshaw-Fulton Controls Co	Santa Ana Freeway at Euclid Ave., Anaheim, Calif.	172	San Francisco.
Rochester Gas & Electric Corp	89 East Ave., Rochester, N. Y	405	New York.
Rohm & Haas Co	222 West Washington Sq., Philadelphia, Pa.	250	Washington Division of Raw Materials.
Rollins Burdick Hunter Co	231 South La Salle St., Chicago, Ill	218	Chicago.
Rural Cooperative Power Association.	Elk River, Minn	262	Schenectady.
The Rust Engineering Co	2109 5th Ave., North Birmingham, Ala.	524	Savannah River.
St. Paul Fire & Marine Insurance Co.	111 West 5th St., St. Paul, Minn	163	Chicago.
Salem-Brosius, Inc	Post Office Box 2222, Pittsburgh, Pa	298	Do.
Sanderson & Porter	52 William St., New York, N. Y	669	New York.
Kenneth E. Sanger	250 East 43d St., New York, N. Y	558	Do.
Sargent & Lundy	140 South Dearborn St., Chicago, Ill	122	Chicago.
Maurice R. Scharff	366 Madison Ave., New York, N. Y	327	New York.
Samuel A. Scharff	do	328	Do.
City of Seattle, Department of Lighting.	1015 3d Ave., Seattle, Wash	484	Hanford.
Seminole Electric Cooperative, Inc.	Post Office Box 208, Madison, Fla	614	Savannah River.
George G. Sharp, Inc	30 Church St., New York, N. Y	215	New York.
The Sharples Corp	2300 Westmoreland St., Philadelphia, Pa.	359	Do.
The S. W. Shattuck Chemical Co	1705 Soth Bannock St., Denver, Colo	656	Albuquerque.
Harvey A. Shiffer	3903 North Figueroa St., Los Angeles, Calif.	591	San Francisco.
Signal Oil & Gas Co	811 West 7th St., Los Angeles, Calif	316	Do.
Sinclair Research Laboratories, Inc	400 East Sibley Blvd., Harvey, Ill	380	Chicago.
Singmaster & Breyer, Inc	Graybar Bldg., 420 Lexington Ave., New York, N. Y.	256	New York.
Siskon Corp	Post Office Box 889, Reno, Nev	148	San Francisco.
Ludwig Skog, Sr	849 Michigan Ave., Wilmette, Ill	398	Chicago.
Sloan-Kettering Institute for Cancer Research.	410 East 68th St., New York, N. Y	681	New York.
A. O. Smith Corp	Post Office Box 584, Milwaukee, Wis	264	Chicago.
S. Morgan Smith Co	York, Pa	187	New York.
Smith, Hinchman & Grylls, Inc	800 Marquette Bldg., Detroit, Mich	494	Chicago.
Roy Baker Snapp	1625 K St. NW., Washington, D. C	619	Washington civilian application.
Socony Mobil Oil Co., Inc	26 Broadway, New York, N. Y	444	New York.
Solar Aircraft Co	2200 Pacific Highway, San Diego, Calif	220	San Francisco.
Solar Energy Corporation of America.	103 Park Ave., New York, N. Y	400	New York.
South Carolina Electric & Gas Co	328 Main St., Columbia, S. C	376	Savannah River.
Southern California Edison Co	601 West 5th St., Los Angeles, Calif	386	San Francisco.
Southern Engineering Co	1000 Crescent Ave. NE., Atlanta, Ga	182	Savannah River.
Southern Research Institute	917 South 20th St., Birmingham, Ala	228	Oak Ridge.
Southern Services, Inc	600 North 18th St., Birmingham, Ala	441	Savannah River.
Southwestern Gas & Electric Co	428 Travis St., Shreveport, La	183	Chicago.
Speer Carbon Co	St. Marys, Pa	231	Do.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
Spencer Chemical Co	610 Dwight Bldg., Kansas City, Mo	144	Albuquerque.
Sperry Gyroscope Co., division of Sperry Rand Corp.	Mail Station A-37, Great Neck, N. Y	671	New York.
Standard Oil Co. (Ind.)	910 South Michigan Ave., Chicago, Ill.	338	Chicago.
The Standard Oil Co. (Ohio)	2127 Cornell Rd., Cleveland, Ohio	198	Do.
The board of trustees of the Leland Stanford Junior University.	Stanford University, Stanford, Calif	612	San Francisco.
Stanford Research Institute	Post Office Box 858, Palo Alto, Calif	158	Do.
Stanley Engineering Co	Hershey Bldg., Muscatine, Iowa	293	Chicago.
Stauffer Chemical Co	380 Madison Ave., New York, N. Y	703	San Francisco.
The Stearns-Roger Manufacturing Co.	660 Bannock St., Denver, Colo.	377	Albuquerque.
Jack Da Costa Stevens	1000 2d Ave., Seattle, Wash	515	Hanford.
Ray L. Stoker	Post Office Box 573, Idaho Falls, Idaho	593	Idaho.
Ben Stone	956 Westwood Dr., Birmingham, Mich.	223	Grand Junction.
Stone & Webster Engineering Corp.	49 Federal St., Boston, Mass	124	Schenectady.
Structural Clay Products Research Foundation.	20 North Wacker Dr., Chicago, Ill	423	Chicago.
Struthers Wells Corp	Warren, Pa	422	Do.
Studebaker-Packard Corp	1580 East Grand Blvd., Detroit, Mich	571	Do.
Sun Shipbuilding & Dry Dock Co	Chester, Pa	128	New York.
Sundstrand Machine Tool Co	2531 11th St., Rockford, Ill	181	Chicago.
Superior Steel Corp	Carnegie, Pa	564	Do.
Sylvania Electric Products, Inc	Atomic Energy Division, Bayside, N. Y.	260	New York.
City of Tacoma Light Division	Post Office Box 1639, Tacoma, Wash	485	Hanford.
Talco Engineering Co., Inc	2685 State St., Hamden, Conn	177	New York.
Tampa Electric Co	Tampa, Fla	168	Savannah River.
Edward S. Taub	250 East 43d St., New York, N. Y	559	New York.
Taylor Instrument Cos	95 Ames St., Rochester, N. Y	114	Schenectady.
Technical Research Group	17 Union Square West, New York, N. Y.	296	New York.
Technical Services, Inc	1506 Commerce St., Dallas, Tex	392	Santa Fe.
M. Ten Bosch, Inc	80 Wheeler Ave., Pleasantville, N. Y	341	New York.
Tennessee Valley Public Power Association.	6th and Cherry St., Chattanooga, Tenn.	368	Oak Ridge.
William P. ter Horst	Box 510, Route 7, Pikesville, Md	394	Washington, civilian application.
The Texas Co	Beacon Laboratories, Beacon, N. Y	425	Grand Junction.
Texas Electric Cooperatives, Inc	Post Office Box 14, Austin, Tex	418	Albuquerque.
Texas Electric Service Co	Electric Bldg., 7th and Lamar Sts., Fort Worth, Tex.	390	Do.
Texas Power & Light Co	Fidelity Union Life Bldg., Dallas, Tex	391	Do.
Texas Utilities Co	1506 Commerce St., Dallas, Tex	393	Do.
Thermal Research & Engineering Corp.	Conshohocken, Pa	348	New York.
Thompson Products, Inc	23555 Euclid Ave., Cleveland, Ohio	330	Chicago.
Thorshov & Cerny, Inc	400 Metropolitan Bldg., Minneapolis 1, Minn.	481	Do.
Titanium Zirconium Co., Inc	Flemington, N. J	511	New York.
The Toledo Edison Co	Edison Building, Superior and Madison, Toledo 4, Ohio.	402	Chicago.
The Travelers Insurance Cos	700 Main St., Hartford 15, Conn	235	New York.
Underwriters' Laboratories, Inc	207 East Ohio St., Chicago 11, Ill	506	Chicago.
Union Asbestos & Rubber Co	3110 West 51st St., Chicago, Ill	576	Do.
Union Carbide & Carbon Corp	30 East 42d St., New York 17, N. Y	192	New York.
Union Electric Company of Missouri.	315 North 12th Blvd., St. Louis 1, Mo	556	Chicago.
United Engineers & Constructors, Inc.	1401 Arch St., Philadelphia 5, Pa	492	New York.
The United Gas Improvement Co	1401 Arch St., Philadelphia 5, Pa	415	Do.
United States Hoffman Machinery Co.	105 4th Ave., New York 3, N. Y	541	Do.
United States Rubber Co	General Laboratories, Passaic, N. J	184	Do.
United States Steel Corp	525 William Penn Place, Pittsburgh 30, Pa.	460	Chicago.
Universal Industrial Equipment Co	1625 Paterson Plank Rd., Secaucus, N. J.	693	New York
Universal Products Corp	1625 Paterson Plank Rd., Secaucus, N. J.	692	Do.
Universal Winding Co., Inc., Patterson Moos Division.	90-28 Van Wyck Expressway, Jamaica 18, N. Y.	282	Do.
Uniworld Research Corporation of America.	1302 Ontario St., Cleveland, Ohio	622	Chicago.
Utah Power & Light Co	Post Office Box 899, Salt Lake City, Utah.	549	Idaho.
Utica Drop Forge & Tool Corp	2415 Whitesboro St., Utica, N. Y	310	Schenectady.
Vacuum Metals Corp	Post Office Box 977, Syracuse, N. Y	329	Do.
Velsicol Chemical Corp	330 East Grand Ave., Chicago, Ill	663	Chicago.

Cumulative list of access permits issued through Dec. 31, 1955—Continued

Permit holder	Address	Permit No.	AEC office implementing permit
Victor Chemical Works	155 North Wacker Dr., Chicago, Ill	357	Chicago.
The Victoreen Instrument Co	3800 Perkins Ave., Cleveland, Ohio	673	Do.
Virginia Electric & Power Co	7th and Franklin Sts., Richmond, Va	442	Oak Ridge.
University of Virginia School of Engineering.	Thornton Hall, Charlottesville, Va	414	Do.
Vitro Corporation of America	261 Madison Ave., New York, N. Y	291	New York.
Wah Chang Corp	233 Broadway, New York, N. Y	661	Do.
Wallingford Steel Co	Wallingford, Conn	421	Do.
Walworth Co	60 East 42d St., New York, N. Y	230	Do.
Warner Electric Brake & Clutch Co	Beloit, Wis	255	Chicago.
Washington State Power Commission.	414 Insurance Bldg., Olympia, Wash	639	Hanford.
Washington University Sever Institute of Technology.	St. Louis, Mo	538	Oak Ridge.
Malcolm W. Wehrung	1125 National Press Bldg., Washington, D. C.	249	Washington civilian application.
George L. Weil	1025 Connecticut Ave. NW., Washington, D. C.	636	Do.
Joseph R. Weiss	250 East 43d St., New York, N. Y	561	New York.
John M. West	Argonne National Laboratory, Lemont, Ill.	333	Chicago.
The West Penn Electric Co	50 Broad St., New York, N. Y	355	Do.
West Penn Power Co	14 Wood St., Pittsburgh, Pa	389	Do.
West Texas Utilities Co	Abilene, Tex	244	Do.
Western Filter Co	Post Office Box 6748, Denver, Colo	227	Albuquerque.
Western Light & Telephone Co., Inc.	2015 Forest, Great Bend, Kans	365	Do.
Western Massachusetts Cos	45 Federal St., Greenfield, Mass	272	Schenectady.
The Western Trader & Investor	324 Beason Bldg., Salt Lake City, Utah	427	Idaho.
Westinghouse Air Brake Co	3 Gateway Center, Pittsburgh, Pa	532	Chicago.
Westinghouse Electric Corp	do	429	Do.
Westinghouse Electric International Co.	40 Wall St., New York, N. Y	101	New York.
Weston Electrical Instrument Corp	614 Frelinghuysen Ave., Newark, N. J	300	Do.
C. H. Wheeler Manufacturing Co	19th & Lehigh Ave., Philadelphia, Pa	433	Do.
Whirlpool-Seeger Corp	300 Broad St., St. Joseph Mich	166	Chicago.
Robert Roy White	Department of Chemical and Metallurgical Engineering, University of Michigan, Ann Arbor, Mich.	171	Do.
The J. G. White Engineering Corp	80 Broad St., New York, N. Y	284	New York.
Whitman, Requardt & Associates	1304 St. Paul St., Baltimore, Md	290	Washington civilian application.
Wisconsin Electric Cooperatives	Post Office Box 686, Madison, Wisc	512	Chicago.
Wisconsin Electric Power	231 West Michigan St., Milwaukee, Wisc.	595	Do.
Wisconsin Power & Light Co	122 West Washington Ave., Madison, Wisc.	544	Do.
Wolverine Electric Cooperative	302 South Warren Ave., Big Rapids, Mich.	115	Do.
Worthington Corp	401 Worthington Ave., Harrison, N. J	646	New York.
Wyandotte Chemicals Corp	Wyandotte, Mich	643	Chicago.
Yankee Atomic Electric Co	441 Stuart St., Boston, Mass	152	Schenectady.
York Research Corporation of Connecticut.	1 Research Dr., Stamford, Conn	633	New York.
Robert W. Zehring	1109 Spring St., Silver Spring, Md	550	Washington civilian application.

Mr. EVINS. Some testimony was given here regarding the danger we might develop from industry developing these reactors. It occurred to me that might be a very good reason why the Government should develop the reactors, and thereby you would have a safe control over matters which are not otherwise regulated if turned over to industry.

Mr. STRAUSS. Industry is to be subject to the same control as any other operation. All of our Government operations, all of our reactors are operated for the Government by private industry. In the Democratic administration and in the Republican administration that has succeeded it, each reactor has been awarded by contract to some private industry which is the operator. There are no Government operators.

EXPERIMENTAL PROGRAM

Mr. EVINS. You state on page 13 of your statement that the Commission experimental program includes a number of projects aimed at construction of smaller pilot plant models. My comments at the time were how many, how extensive? You say a number. That is very indefinite.

Mr. STRAUSS. Will Dr. Davis give us some figures on that?

Mr. DAVIS. There would be in these the 4 reactors that originally were in the 5-year program, the sodium reactor experiment, the boiling water reactor, fast reactor, the homogenous reactor, the organic reactor experiment, and liquid fuel reactor experiment, and under the Army program a closed cycle gas turbine reactor experiment.

Mr. EVINS. Thank you Mr. Davis. Thank you, Mr. Strauss.

Mr. CANNON. The committee will resume at 10 o'clock tomorrow.

THURSDAY, JUNE 14, 1956.

Mr. CANNON. The committee will be in order.

Resuming our hearing on the Atomic Energy Commission budget, the Chair recognizes the gentleman from Massachusetts, Mr. Boland.

Mr. BOLAND. Mr. Strauss, I do not have too many questions. I do have a few observations. The lack of questions is occasioned by the very excellent manner in which you have questioned the Commission yesterday. Consequently, I think you have covered very thoroughly most of the material that I would have any desire to go into.

I do want to compliment the Chairman of the Commission for his statement and for his appearance here and the manner in which he has handled himself in response to the questions that have been asked. Like all of us on this committee, and in the Congress, and I suppose like every citizen of the United States, we are concerned with a Commission that has such great power as does the Atomic Energy Commission. It is engaged, of course, in the most important work of the present, and the most important work of the future, and consequently the manner in which it is run and the ability of its members to get along with each other is of prime importance. I am not concerned with the little differences of opinion that the Commission has. I think it is good; it is healthy. I think the Commission is far better off having differences of opinion than having unanimity of opinion on all matters. I do want to compliment the Commission for its administrative cost, its 2.3 percent administrative cost as compared to the total operating cost. As I recall, and Mr. Phillips may correct me, we have heard justifications for budget requests from 17 or 18 agencies or other independent offices. Isn't this a rather remarkable figure?

Mr. PHILLIPS. Yes, very unusual.

Mr. BOLAND. So I compliment the Commission for that, and its budget officers and all its employees.

AEC RESPONSIBILITY FOR TRAINING

Relative to the training of scientists, I do not quite see what responsibility the AEC has in this particular field except perhaps to

come up on its own, on an individual basis, on a personal basis, with some suggestions. I do think that the Federal Government has failed to do the job it ought to do. It has failed to come up with the recommendations. I attribute that to the failure of the administration itself. I think that is where the blame lies.

There are a great number of agencies that ought to be concerned with this problem. The National Science Foundation, National Committee on Aeronautics, all of those are vitally concerned with the lack of engineers. In the hearings that we have held with those particular agencies they have decried the lack of engineers, but they too have not come up with any solid ideas.

I think perhaps the big responsibility ought to rest with the National Science Foundation. I think it has a better opportunity to do it, and that is where the job ought to be done. As a personal opinion I might say that I think great stress ought to be placed upon the fact that we ought to emphasize more in the secondary schools, but I think sometimes we ought to emphasize in the primary schools. I think most of the young boys and girls who are in primary schools shy away from mathematics, and if they have any opportunity to get out of it, they do, and the don't give the study the effort it demands, with the result that they don't build up any respect for it, and they don't build up any yearning for it.

I think that if we start early in the primary schools, and of course that is the responsibility of the teachers, who are there, and the school administration. I think if we started there to build up some respect and love for it and some yearning for it, I think we would have less difficulty in the secondary schools and consequently less difficulty when the student goes on to a school of higher education.

That is my personal view. I think perhaps it has some sound basis to it.

YANKEE ATOMIC ELECTRIC COMPANY

Now, in relation to the Yankee Atomic Electric Co., you say that the application was filed April 1, 1955, and the final contract was not approved until last week or the week before last. Can you tell me what was responsible for the timelag?

Mr. STRAUSS. Would you answer that, General Fields?

Mr. FIELDS. Yes. When the original proposal was received, it asked for certain things that we had not offered in the proposal as it was circulated. This was then sent back to them for reconsideration. Negotiations were not authorized by the Commission.

We went back to discuss certain elements that did not seem to meet the criteria that we had set forth in the proposal.

Mr. BOLAND. What was the contribution that the Yankee Atomic Electric Co. was looking for from the Federal Government, the original request?

Mr. FIELDS. In the original request they were looking for research and development assistance as is now in the contract. They were also looking for, and this did not meet the criteria, as I recall, certain assistance in the form of monetary assistance in the reprocessing of the fuel in the future. This was not offered in the proposal as put to the public back during the first of that year.

I think this was the major element of that on which we had to talk to them, and they had to modify their proposal and eliminate that. This would have been a subsidy for processing of the fuel over the years in the future, and we had not offered this.

Mr. BOLAND. What would have been the cost of the subsidy?

Mr. FIELDS. Dr. Davis, do you recall?

Mr. DAVIS. My recollection was $2½ million for the initial period. I am not completely sure of that number.

Mr. BOLAND. How much are you assisting now? What is the monetary assistance now to the Yankee Atomic Electric Co.?

Mr. DAVIS. Roughly $4 million, and the research and development leading up to the construction.

Mr BOLAND. Is that a one-shot operation?

Mr. DAVIS. That would be completed before the reactor would go in operation. There is one element here, too, and that is in the interim the Yankee Atomic Electric Co. also changed the reactor. They came in for a proposal for one type of reactor, and then came in with a proposal for another type of reactor.

Mr. BOLAND. The AEC is putting $4 million into the plant?

Mr. FIELDS. Not, in the plant, in research and development assistance. This may be the performance of criticality experiments for them or work of this nature. It will not be represented by any bricks or mortar or any part of the plant.

Mr. BOLAND. I see. Thank you.

Now, in the matter of basic research, the Commission of course is interested in it, and you do have, I presume, programs in basic research; do you?

Mr. FIELDS. We do.

Mr. BOLAND. Then is there any overlaping between the NACA, the Department of Defense, and the National Science Foundation in the matter of basic research? Is there a coordination among those groups?

Mr. STRAUSS. There is a coordination and there is some participation in the projects, but so far as we are able to ascertain, and they are equally keen about it, there is no duplication.

Mr. Boland, may I comment on a comment you made earlier? First, I would like to thank you for the expression with which you began. Yesterday I gave the impression in my testimony that the youth of the country bore a substantial portion of the blame for the lack of initiative to go into these particular disciplines. My attention was called last night to a publication put out by the Department of Labor in 1949, the purport of which was to the effect we were headed toward an overproduction of scientists and engineers. Now, the extent of the effect of such a document on the climate of the period in the ensuing years might have been quite substantial.

Mr. BOLAND. Mr. Chairman, I have no more questions except again to commend the Commission for the manner in which it is performing its job. I think it is doing a magnificent job, one of the toughest jobs that any governmental agency has.

Mr. STRAUSS. Thank you, sir.

Mr. CANNON. The gentleman from Illinois, Mr. Murray.

SALARIES OF SCIENTISTS

Mr. JAMES C. MURRAY. Mr. Commissioner, I was reading an article this morning about you, a very nice article, in the Washington Post. The article stated that the top scientists in your Commission get $6,000 a year. Was that an accurate statement?

Mr. STRAUSS. No, sir, that was not an accurate statement, and it was not an accurate statement that I did not graduate from high school. I certainly did; I was the first man in my class. That is the only academic distinction I hold. I am sorry to be deprived of it. There were a number of inaccurate statements in that article which I am satisfied was well intentioned. My wife is quite distressed about it, too.

Mr. JAMES C. MURRAY. What is the average top salary?

Mr. STRAUSS. Let me refer that to the General Manager. For scientists, you mean?

Mr. JAMES C. MURRAY. Yes; for scientists.

Mr. FIELDS. I don't know quite how to define the words "average top salaries," but salaries do run in the neighborhood of ten, twelve thousand dollars for scientists and technicians, and even higher for the ones that are laboratory heads or heads of divisions in laboratories.

Mr. STRAUSS. On the other hand, they are not paid by the Commission.

Mr. FIELDS. They are not paid directly by the Commission. They are on the rolls of our contractors generally, the scientists and the technicians.

Mr. JAMES C. MURRAY. The scientists and technicians are generally on the rolls of the contractors?

Mr. FIELDS. Generally in our research laboratories they are contractor employees. They are paid the rates that correspond generally to the rates of other institutions around the country.

Mr. JAMES C. MURRAY. Do you have any scientists in the Commission that are paid $6,000 a year?

Mr. FIELDS. We have some scientists in our own staffs such as in the Division of Research and the Division of Reactor Development. I do not believe there are any scientists, qualified as top scientists, who are paid $6,000. Most of them are paid more. They may be GS–14, 15. The highest ones we have on the Commission staff itself, the division directors, are paid the statutory limit of $16,000 a year.

Mr. JAMES C. MURRAY. Suppose there was a young man who decided to go into this field as a career, how much would you estimate he would have to spend on his education after high school? Or would you be able to estimate that?

Mr. FIELDS. You mean if we were to employ a high school——

Mr. JAMES C. MURRAY. If a youngster in high school decided on a career in this field how much would he have to pay for an education to be trained sufficiently to be hired by you?

Mr. STRAUSS. I think that would depend on whether he got a scholarship, whether he carried his postgraduate education beyond the master's degree. In other words, whether he took a doctorate and whether he took postdoctoral study. Also, if he were a scholarship student, he would have other living expenses. But on the assumption that there are scholarships available to men who have gotten their

bachelor degrees, I would say a $10,000 investment in that education as a minimum would not be out of line.

Mr. JAMES C. MURRAY. Including the scholarship, because that would certainly have a monetary value. What do you estimate that would run?

Mr. STRAUSS. I am out of my depth, sir. I would like to supply those figures for you because I am interested in them myself, but to pull them out of my sleeve is impossible.

Mr. LIBBY. I estimate it would cost in the order of $2,000 a year for 7 years. As you say, if he had a scholarship, he received something of real value and it should be counted; $15,000 would be a good figure from high school until the end of the graduate degree.

NOTE.—Further information was supplied as follows:

According to recent estimates, the average cost of educating scientific and engineering students in colleges and universities in the United States is as follows:

Through the B. S. degree	$10,000
Through the M. S. degree	13,000
Through the Ph. D. degree	20,000

It should be noted that these estimates include not only the cost to the student but also those costs incurred by the institution, and by the taxpayer in the case of State colleges and universities. Because these are average costs, figures for top-ranking universities would be considerably higher.

Mr. JAMES C. MURRAY. After he has his graduate degree and he is qualified, what could he expect to make going with you?

Mr. LIBBY. At the present time on the order of $8,000 per year with the most advanced graduate degree. That is the doctorate degree. Perhaps $9,000. Eight to nine thousand dollars is what he could command from our contractors as a new graduate, I mean new doctors of philosophy, and maybe he might go to $10,000 in some cases. But eight to ten thousand dollars would be the range.

Mr. STRAUSS. It might interest you to know, sir, that in Boston last week I was told by the president of a college that representatives of industries were there to see his top graduates, and were being interviewed by the graduate students, instead of the reverse procedure. The law of supply and demand has operated to make this a seller's market.

Mr. LIBBY. I think it should be said, Mr. Murray, in further clarification of this point that whereas the starting salaries are quite attractive, the salaries of the men who have been employed for a certain period are not much above those starting salaries. Though a man can look to a fairly good starting salary, at the moment he has difficulty looking to continued salary increases in very many companies. There are a few companies that are changing over, but of course this involves an enormous increase in the total salary roll, and it is a great revolution for them.

Mr. JAMES C. MURRAY. That is the reason for my line of questioning. If young men in the high-school grades balance on the one hand their expense and potential earning power in your field with what they might earn without a college education in, say, the building trades, I would say the monetary attraction would be to the building trades. It does not take a degree for an electrician or plumber to earn $6,000 a year in most cities. As a matter of fact, I think the electricians

that are employed in your installations are making six to seven thousand dollars a year?

Mr. STRAUSS. I think there are disparities like that. The same might be true of bricklayers, for example. But I do not believe there is a competition for graduates actually between the white collar and the dungaree jobs. The percentage of employees of a company like Westinghouse who have college degrees is substantially higher—I did know the figures, but I don't want to trust to my memory—than it was 10 years ago or 10 years prior to that. There is little doubt in my mind but what it will be almost impossible in another decade for a man to find employment, white collar employment, without some kind of a degree. It is not, therefore, the absence or possession of a degree that concerns us as it is that that degree should be in the sciences or in math, and the higher rewards, higher than those that Dr. Libby has indicated, do attract and do reach scientists and engineers who, to our regret, are siphoned off into management and sales as a result of great ability, and into administrative posts rather than posts where their particular engineering or scientific training is employed.

But surveys of college classes some years after graduation, most recent ones, indicate that the doctors 10 years out have the highest incomes, and engineers are the next. The former advantage that the legal profession enjoyed is no longer as evident.

Mr. JAMES C. MURRAY. Yes; I can attest to that.

AVAILABLE INFORMATION ON ATOMIC ENERGY

Mr. JAMES C. MURRAY. One of the comments or complaints I have heard is that the written works in this field are so technical that only an expert can understand them, or they are so simple that they are completely uninformative. I was wondering whether there was any work in this field that, say, a high-school teacher could use to gain enough information so that he could interest his students in the field.

Mr. STRAUSS. Yes, sir; there are great numbers of textbooks that have been written in this field, and some quantity of them specifically directed to students of high school age. They are of varying degrees of excellence. I have looked at a number of them and purchased a considerable number of them to send to young friends. They are available.

Mr. LIBBY. I think it is true, however, Mr. Chairman, that we could improve in this. The books are good, but they could be better, and we could also have some interesting laboratory experiments in high schools which would help the students understand the matter explained in the books. I think that maybe the Commission can help on that by encouraging these kinds of laboratory experiment in the high schools and maybe giving them isotopes and things like that which would help. But the books are are pretty fair.

Mr. JAMES C. MURRAY. Are they available to high schools?

Mr. LIBBY. Yes.

Mr. JAMES C. MURRAY. Is there a program available now for high schools?

Mr. LIBBY. We have one that is available. I think we need to improve it. It is a set of experiments which can be performed in the high-school chemistry or physics laboratory, and uses isotopes

which are so small in amount as to be completely harmless, and I think this interests students and gives them some feeling or understanding about atomic energy which they do not get from just reading a book. It helps a little bit to hear a geiger counter click and pour the solution and do experiments with it. But we can improve on these. We are working on that.

Mr. FIELDS. This summer we have offered a course in radioisotope techniques at Oak Ridge. I have forgotten the number of individuals involved. This will be for high-school teachers to come down and take a short course in radioisotopes, looking at some of the instruments which are used and which they might use back in the schools. We are starting something of this nature. There are also moving pictures which are available.

Mr. JAMES C. MURRAY. On another subject, are there anny studies available with respect to State legislation in the health and safety field in connection with these commercial power reactors?

Mr. STRAUSS. Yes, sir. We have been dealing with the States. We have met with the representatives of the States within fairly recent weeks.

Is Mr. Price here—I am sorry we are divided this morning. There is a hearing on Senator Anderson's insurance bill before the joint committee and Mr. Price is there with Commissioner Vance.

Mr. FIELDS. Maybe I could outline it a little.

We have quite close collaboration with the State representatives at this time and since the passage of the Atomic Energy Act, we have promoted cooperation with them in studying the problem of regulation and safety.

Last summer for instance we invited representatives from all States to meet with us and had a very large gathering. I believe there was a representative from most every State, including the Governor of Michigan who attended. Out of this came a resolve to work very closely together. There also was formed a committee of State representatives, consisting of 12 members, which have met with us on several occasions studying the problem of how our regulations and licensing and theirs could best be meshed together.

Mr. JAMES C. MURRAY. Have any of the States formed committees to work with you on that?

Mr. FIELDS. Some of the States are active in the field, yes, sir. Mr. Price is here now. I would ask him to answer the question.

Mr. PRICE. A number of the States have either by legislation or by acts of the governor appointed commissions or committees representing the various segments of the State government that have an interest, or may in the future have an interest, in some aspect of the atomic energy business. What they are doing mostly at the present time is really surveying the role of the States in the various agencies, and the impact that an atomic energy industry would have on the various activities like rate regulation, health, and safety problems, and the like.

Mr. JAMES C. MURRAY. I want to thank you, Mr. Chairman, for a very informative statement, and wish to express my appreciation to all the people in your Commission for the work they do no our behalf with obviously very little material return.

Mr. STRAUSS. Thank you, Mr. Murray, on behalf of all of us.

Mr. JAMES C. MURRAY. That is all, Mr. Chairman.

Mr. CANNON. Mr. Phillips.

Mr. PHILLIPS. Since practically all of the members of this committee have asked questions about the education matter, I think that is an excellent indication of the concern that the Congress feels and this committee feels on that subject. The other subcommittee that Mr. Boland and I serve on is also interested, and we have the National Science Foundation.

Now, I have felt with no disrespect to the National Science Foundation that if any criticism for sins of omission rather than commission were to be leveled, they should be there. The foundation has certainly not in my experience measured up to the demand of the emergency. Perhaps this comes in the way of a question. I don't think any amount of money voted by the Congress is going to solve it. I think that you have to create an interest in the student, as Mr. Murray has just said. I think that is the problem and anything we can do to meet that problem is going to solve this, and nothing else.

Now, over a period of a generation we have been turning out of our colleges a succession of students who have not been interested in engineering, but who have been interested in the humanities and with a marked socialistic trend in some of these interests. Those people now become the teachers in the high schools of the next generation. How do you expect a teacher who has no interest himself or herself in physics, chemistry, or mathematics, to create an interest in chemistry, physics, and mathematics, on the part of the students who come under that teacher. That is a problem and I confess to a very serious concern about it because the only answer I know is to take another generation and train them with an interest in it.

Now, that being the fact, and I holding the theory that money won't solve it, I think Mr. Fogarty's illustration yesterday was excellent so far as it went in the medical schools, but the medical schools already have a student who is interested in medicine. The medical schools have to turn down students for applications. As a consequence, when this Congress appropriates money for laboratory facilities out of the HEW subcommittee, it is not quite comparable.

What we are trying to do is to get the student interested earlier. Now, after that general statement on my part, Mr. Strauss, since this committee seems to think you are an authority on all subjects, will you please tell us what in the name of heaven we are going to do to create an interest on the part of high-school students?

Mr. STRAUSS. Well, sir, you and this committee have answered one question for Dr. Libby and myself. We thought we were whistling in the dark or shouting in the wind but there is ample demonstration here today and yesterday that it is not the case, that we—we and others who have been concerned about this subject—have made an impression perhaps not beyond our hopes, but beyond our expectations. It is an expansion of this very attitude that most of the members of your committee have evidenced that will, I believe, correct this thing. We cannot, as Chairman Cannon, has said, wait for a generation. Then we will be completely outdistanced. It must be done within the next 5 years. We have to make it impossible for students to obtain college educations without having been exposed to these disciplines.

My belief is that exposure to the disciplines will produce applicants for degrees in those subjects. It always has. A large percentage of

the American boys are interested in natural science and engineering; I don't think the genes have changed that suddenly.

Mr. PHILLIPS. You remember for a while it was very unpopular to go into engineering, because the students were told when they entered college that there was no opportunity at that moment to go into the engineering field, it was pretty well filled. I think the echoes of that are still ringing in the college halls.

Mr. STRAUSS. It was that very thing to which I called attention a moment ago. There is unfortunately a Government publication which stated that as a matter of fact, as recently as 7 years ago.

Mr. PHILLIPS. All of us, I imagine, or at least most of us in this group follow the method of having an examination for the Academies. It is in July this year, and makes it easier for us to avoid the political pressures which might ensue. I am astounded when students come out of high schools to take examinations which consist only of algebra, spatial relations, and English that students get marks of 8 and 13 in algebra. I don't see how they got through their course in high school. The average of the marks of the examination a year ago were absolutely incredible. I think the average would have been below 25, certainly well below 40, in the entire group that went in to take the examination for my appointments. The Academies necessarily have to lean heavily on mathematics and science today, and these students knew they were preparing for West Point and Annapolis and the Air Academy, and then they get marks below 25 in algebra.

So much for that, Mr. Chairman. Now, briefly on the subject of insurance, because that has interested me, in this matter of third party liability which was discussed by Mr. Fogarty yesterday, I have only one question. I think that probably is directed to Dr. Dunham.

Isn't that the same situattion which medicine faced years ago when it began to need liability insurance in its own practice? It was very difficult to get an adequate amount of liability insurance for the individual doctor, because there was no actuarial history, and then it was difficult for certain lines of work. For example, the technician in X-ray work might find it very difficult to get adequate coverage or protection. Lloyds came into the field with policies because they will take areas where others will not. But today the physicians as a matter of routine are covered by liability insurance in individual practice. Isn't that the same situation that exists here where today we come into a new field with no history of any kind, very few plants that are going to want to be covered? Perhaps 10 years from now when there are lots of plants and some history, it will be no problem at all.

Dr. DUNHAM. I am not familiar with the history of the development of liability insurance and general liability of physicians. Your statement as far as today is concerned is correct, there is no problem whatsoever. I don't know when it began whether the rates were high or not.

Mr. PHILLIPS. My recollection over 40 years is that it was difficult and that Lloyds was one of the first to give such protection. I think we are going through the same thing here and I do not think we need have any special concern. I think actually we are moving with great rapidity. Which leads me to my next comment or question which has to do with putting the reactor in an airplane.

I remember very well—Mr. Boland, you were not yet on the committee—when both this group, and especially the NACA sat before our

subcommittee and said, this was the NACA, "We cannot have an atomic-energy-powered plane. We never could get it off the ground." It is all on the record. I think they would like to take it off now. The fact of the matter is that we have just two problems. One is getting the plane off the ground and the other is the lighter weight of the plane.

(Discussion off the record.)

Mr. PHILLIPS. Am I right that that is your problem when you say—haw many years do you say?

(Discussion off the record.)

Mr. PHILLIPS. Will you give me a dollar for every year less than that, if I give you a dollar for very year more than that?

Mr. STRAUSS. I would like to take the other side. I think it is less.

Mr. PHILLIPS. Is that public information?

Mr. STRAUSS. It is not public information, sir, and all the things that you have indicated, and others, are being actively pursued coordinately with the development of the propulsion plant.

UNITED KINGDOM NUCLEAR POWER PROGRAM

Mr. PHILLIPS. My next question, Mr. Strauss, relates to coal. You would not look at my hand today and think I knew anything about coal mining, but my grandfather was a Cornish miner, and I worked in a coal mine. I think my grandfather has turned over so many times in his grave that he is worn to a high polish. To sit here and say that the United Kingdom is doing what our chairman called a crash program in atomic energy because it is out of coal is completely out of this world, because that is not the fact in any sense of the word. It is merely because the coal industry of Britain has been taken over by the Government. That is the answer in simple language. In 1946 the coal industry of Britain produced the coal needed and made a profit of 15 million pounds. Then the Government took it over. The next year they did not produce enough coal for their own needs at a loss of 23 million pounds. The present daily producton of a coal miner in England is less than 300 tons a year while in this country the average production would be over 1,500—about 1,560 tons per year. I believe Great Britain's experiences with the nationalization of the electric industry and other industries have had uneconomic results.

Now, as I said, any idea that we are taking coals literally to Newcastle for the British, that they are going into this terrific production, presumably with our money—you can correct me if I am not right—on the atomic energy production because they have not coal is something which should not be given credence in the United States.

Now, am I right, Mr. Strauss?

Mr. STRAUSS. Mr. Phillips, I am unable to confirm or dispute the economic argument. The facts I suspect are as you state them. But if they are not getting the coal out either because they are not mechanized as we are in mining or because the miners are inefficient, or for whatever reason——

Mr. PHILLIPS. Mechanization, primarily.

Mr. STRAUSS. I think that is the basic reason.

Mr. PHILLIPS. But the reason they are not mechanized is because the Government does not want to oppose the coal miners.

Mr. STRAUSS. If they are importing the coal at the rate of 19 percent, as stated to me by the chairman of the British Atomic Energy Authority, for the year 1956, and if that figure is correct, and if it is supposed to be an increasing figure, then that is the reason that they are interested in power from atomic energy. If the coal is under the ground and they are not taking it out, or are not able to take it out for whatever reasons, I can see that the pressure on the Government to develop power from some other resource is no less compelling.

Mr. PHILLIPS. Yes, but I will be very frank, my interest at the moment is less with Great Britain than with the United States. I think that it applies directly to what will come before this subcommittee in the way of requests for money. In other words, we have competent fuel industries in other lines. We will eventually exchange many of those methods for atomic energy in my opinion, for the production of power, but because we have no need for a crash program such as Britain seems to think it has a need for, then it seems to me the part of wisdom to develop our power program here just as rapidly as we can, trying out the different types of reactors and not going into what could be called a crash program here of building a number of reactors suddenly, inefficiently, perhaps, to get going quickly before we do know just exastly what kind of reactor is the most economical to build and operate.

Mr. STRAUSS. Yes.

Mr. PHILLIPS. I do think that question is coming up and I think we have to make haste slowly for the actual success of this program on which I am thoroughly and completely sold.

Mr. STRAUSS. Mr. Phillips, might I interject at this point since you are going to move to another subject, simply to say that the figures that I have cited as the percentage of coal that Great Britain would be buying for her power industry this year and in subsequent years are to the best of my knowledge and belief correct, and to the best of my recollection correct, but I am not representing them to be accurate.

Mr. PHILLIPS. Which figures are those?

Mr. STRAUSS. I mentioned 19 percent of her coal would be imported in 1956 and I gave some other figures yesterday for periods on beyond that which I derived from a British publication but I was trusting to my memory to cite them correctly, and I think I had best supply them for the record than to have them remain in the record substantiated by only my recollection.

IMPORTANCE OF TVA POWER TO OAK RIDGE ATOMIC DEVELOPMENT PLANT

Mr. PHILLIPS. I think I have covered all the questions except this one which I include for the benefit of my friend, Mr. Evins, at the other end of the table. Every year I sit here somebody asks the question on this committee that without TVA practically we would not have won the war. So I have some figures prepared. I wish to read them into the record, Mr. Strauss. First of all, TVA's own report for 1948 says:

TVA's ability to supply substantial new blocks of power during the war made possible the Oak Ridge atomic development plant—

and then in 1950 the TVA report again wrenched its arm patting itself on the back and said:

TVA in that dire secret emergency in World War II supplied the electric energy which released the awful power of the atom.

I don't dispute the technical accuracy of either question because the TVA's power did go to Oak Ridge and Oak Ridge made the bomb possible, and so forth, but I want to read into the record these figures, Mr. Chairman, and then to ask Mr. Strauss a question.

The TVA total peak load at Oak Ridge in 1943 was 18,300 kilowatts. In 1944 it was 236,900 kilowatts. It went up through June 1945 to to 351,800 kilowatts. Note these carefully. AEC's own generating capacity at Oak Ridge in 1944 was 186,000 kilowatts and 242,000 in June 1945.

Now, subtracting AEC's own generating plant, this leaves a maximum requirement for the TVA, at that time, that is for outside, we will say, for outside power, TVA or something else, of only 18,300 kilowatts in 1943, 80,000 in 1944, and 128,000 through 1945, June 1945.

Now, keep those figures in mind because the Federal Power Commission reports to which we all have access show that the total dependable capacity of class I utilities that year to have been 39,700,000 kilowatts. This is in 1942. In December 1943, it was 42,400,000 kilowatts. In 1944, in December, it was 43,800,000; and in June 1945 it was 44,100,000.

Now, the corresponding peak loads or demands in the country were 32,900,000 kilowatts for December 1942; 37,100,000 for December 1943; 37,900,000 for December 1944; and 37,200,000 for June 1945, which leads by a very simple process which I am sure even our high-school graduates today could subtract and make, which leaves a reserve capacity of 6,800,000 on December 1942; 5,300,000 in December 1943; 5,900,000 in December 1944; and 6,900,000 in December 1945.

Now, with the need of power at Oak Ridge in excess of its own generating capacity of only 130,000 kilowatts, and an excess power in the United States, which refers to that area also, of course, of almost 7 million kilowatts, wouldn't you agree that the claim of the TVA is a little bit excessive, Mr. Evins, that this was so necessary? Here is this 130,000 kilowatts which is a very small percentage of the available capacity at that time. Isn't it a fact that there were any number of places where the power requirements of Oak Ridge—even if it was located there—could have been obtained at that time?

I might add that the Federal Power report shows that TVA area had a peak power requirement of 1,100,000 kilowatts in December 1941, or 200,000 kilowatts above its dependable capacity.

Mr. Krug said publicly at that time when he was head of the Office of War Utilities and War Production Board that power has never been too little or too late in the United States.

Now, my question is that if this is a fact, would not it be just as good a question for me to ask that with all the steel scarcity in the United States at that time and all the material capacity and all the structural demands upon it, would it not have been better to have used this scarce material for the war needs, rather than to build up this and then say that the TVA practically won the war, Mr. Evins? Wouldn't it have been better to use that material for war purposes,

and not for building the TVA? Wouldn't we have had the power just the same if we had never had the additions to TVA?

I would like to cure this idea once and for all that in every year's report that the TVA is responsible for making the atomic bomb.

Mr. EVINS. Are you directing your remarks or questions to me or to Chairman Strauss of the AEC?

Mr. PHILLIPS. I will let either gentleman decide.

Mr. EVINS. I shall be pleased to respond. First, I would like to commend my colleague, the gentleman from California, on his skill and agility with figures.

Mr. PHILLIPS. It is not agility. I took them out of the book.

Mr. EVINS. My colleague has previously referred to the high degrees in mathematics which he received as a student. Marks in the 88's and 99's that he won in high school in the use of figures. So I submit that he is skilled with "juggling" figures. We know, too, that he is an accountant by profession.

Secondly, I would observe that apparently these excesses of power to which the gentleman refers apply to the total of excess electric power all over the Nation and not power centralized and located in one particular area. Where it all could be economically used.

Mr. PHILLIPS. You mean national power.

Mr. EVINS. National power, total, excesses all over the Nation, and power not in substantial excess amounts located in one area.

Next I would like to say that our own committee chairman, Mr. Cannon and AEC Chairman Strauss agree with the TVA that the TVA in fact produced the power that produced the bomb that won the war, and therefore they are not in agreement with my colleague Mr. Phillips. Yes; the TVA contributed greatly to winning the war.

Mr. PHILLIPS. Correct that by saying that they produced part of it, because the AEC produced part of its own power. Sometimes the TVA forgets that.

Mr. EVINS. I also hope that the gentleman who is leaving us will continue his interest in TVA and in the years ahead. I respect the gentleman, but I do not agree with his figures on electric power surpluses. The majority of the TVA board, including TVA Board Chairman Vogel himself, the President's appointee, said that there is a shortage of electric power needs in the area. Mr. Krug has said so and also indicated the national power needs. The Federal Power Commission points to this fact. In all testimony before all of the committees there is evidence of a growing need for power throughout the Nation. I certainly do not wish to negative or discount or to reduce the power capacity or power production in this country, whether it be atomic energy produced, fossile power produced or hydroelectric power. Let us produce all power possible for our own Nation and have it in abundance for our citizens, agriculture, industry, and national defense purposes.

Mr. PHILLIPS. I thank the gentleman. But in fact he has not answered my question.

Mr. JAMES C. MURRAY. After observing his answer, I would say that our colleague's answer to your question was that the claims of TVA are understated.

Mr. EVINS. Thank you, my colleague.

Mr. PHILLIPS. Mr. Chairman, I have finished.
Mr. CANNON. Mr. Jensen.

BRINGING ATOMIC ENERGY TO THE SCHOOLS

Mr. JENSEN. Mr. Strauss, I was here yesterday and have been here today, and I have attentatively listened to all the testimony that you have given. Like always I hold you and your entire staff in the highest regard. I thank God that there are men like you willing and ready to give of your great knowledge to America for such a small amount of pay. I am sure that any one of you can go out and get possibly 2 or 3 times more in private industry because of the great knowledge that you have of science and the nuclear problem.

I believe it was last year in a hearing, Dr. Libby, that I suggested that you contact the colleges and universities of this country to see if you could not stir them up in getting more of their students in taking the scientific and mathematical courses. I believe you remember that, Dr. Libby, because of the fact that you were greatly concerned about the dearth of scientists, and you have done that.

Now I have another suggestion. Maybe it is not good but I will throw it out for what it is worth.

Would it not be possible to get people in all these colleges and universities who have knowledge of nuclear science to go around to the high schools and lecture and it might be that you folks could spare a little time to do the same thing? I am sure that a great majority of the American boys in high school are intrigued by this atomic energy program. They have a slight knowledge of it. They would like to know more. It is an intriguing subject. I understand you have film. Now you could imagine a scientist from Iowa University, for instance, publicizing the fact in newspapers that he would be at a certain place at a certain time, and would lecture on the nuclear science and that he had a film which would give the audience a little insight into the field of science. I could imagine that you would have a crowd no end because they are thirsty for knowledge in this comparatively new field of atomic energy, and most every college would like to attract high-school students to their college. They send people around to enlist high-school students to come to their college. So they could use this as a method of publicizing their college or university, and in addition to giving inspiration to these boys, that would like to become scientists or mathematicians. Don't you think that could be worked out, Dr. Libby? Maybe you are doing that to some degree.

Mr. LIBBY. I think this is an excellent suggestion Mr. Jensen. As you know, it is an idea that has been bruited about a good deal but it is very nice to hear you say it. We took your suggestion last year very seriously. I am pleased to report that we have made very considerable progress in stirring interest in engineering education, nuclear engineering education in the colleges, and later in the hearing when we go into details we will be discussing some of the particular items which, of course, leads to budget appropriation requests which are substantial.

On this further suggestion of yours, I think it is closer to the problem than the one last year or 2 years ago, whenever it was.

Mr. JENSEN. Last year.

Mr. LIBBY. We have a sort of selfish interest in atomic energy. We are particularly interested in the post-graduate course which will take an engineer educated in some other field and make him interested in atomic energy. We are particularly interested in turning engineers that might go into some other field into atomic energy. That is a little selfish. But in the broader aspect, the whole Nation suffers from a shortage of scientists and engineers, and this suggestion today is very close to that. I think that is the real problem, though, we as the Atomic Energy Commission must first pay attention to our immediate problem, in the end the real problem is in the high schools.

Now we have done relatively little so far but we have done a little bit. I think it is fair to say that whenever one of our employees or one of our contractor's employees has an invitation or gets a notion of going to talk to a high school, he gets his leave with pay at the present time. However, we are doing something more concrete this very summer. We are taking 48 high-school teachers, and bringing them to Oak Ridge, and we are teaching them isotopes and things of that sort for 4 weeks, and then we are going to put about 8 of them on a nationwide tour to last the better part of a year during which they will travel all over the country visiting high schools. Each will have a station wagon with the equipment necessary to conduct demonstrations. It is not exactly your idea, but it is similar in that we take high-school teachers and get them to do this kind of thing.

I think this would supplement your idea. We should have our distinguished scientists talking to the high schools. There is no substitute for that. It would be extremely helpful and I think we should do everything to make it clear to our field offices that this should be encouraged on the part of our employees and then on the part of our contractors' employees.

Mr. JENSEN. The fathers, mothers, and parents would urge their boys—I have no doubt some girls—to attend such meetings. For instance, in one part of my district, Atlantic, Iowa, is the center, they have a pretty big auditorium, that will seat a lot of people.

Yes, Mr. Phillips says the parent teachers association would be a good contact. Now, there are other towns in my district that have large auditoriums. There is Red Oak, Iowa, Shenandoah, Iowa, Council Bluffs, Iowa. You have them in every district in every section of the country. I am satisfied that boys would travel 50, 60 miles to attend one of these demonstrations, to see the film and to hear the lecture of an atomic energy scientist. I hope that you will give that consideration.

Mr. LIBBY. We certainly will.

Mr. JENSEN. Isn't it a fact that it takes an enormous amount of electricity to make an atomic bomb?

Mr. STRAUSS. We are very large consumers of the total power produced in the United States, if that is what you mean. I don't believe that we have identified the amount of electricity required to make an atomic weapon, because that, Mr. Jensen, would pretty well pinpoint the numbers that we have, since our total consumption of power could be easily figured.

Mr. JENSEN. The reason I mention that is this: There are those that think in years to come that atomic energy will replace all electric plants run by steam. The facts are that we are going to have to

have a lot of steam plants, a lot of hydroelectric plants in order to furnish electricity to make atomic bombs.

Mr. STRAUSS. That is right, sir. We have conceived of electricity from atomic energy as supplementing rather than replacing other forms.

Mr. JENSEN. Now, I do not know whether you want to have this on the record or not. You can take it off if you want to. We hear a lot about the Russians passing us in their defense production of every nature and that they have guided missiles that they can shoot across the seas at a pinpointed target here, and hit any city they want to here. We know for a fact that we have the greatest Navy in the world. We also know that we have more airplane carriers from which we can catapult fighting planes and guided missiles. Isn't it a fact that the shorter the distance, the more accurately you can hit a target?

Mr. STRAUSS. I think generally speaking that is true.

Mr. JENSEN. That is true whether you are shooting a beebee gun or a guided missile.

Mr. STRAUSS. Yes, sir.

Mr. JENSEN. We have carriers all around the world and in time of war we could bring them up pretty close the enemy lines from which we could discharge guided missiles where Russia, for instance, would be perfectly unhappy with the result. They don't have the airplane carriers that we have. We know that, don't we?

Mr. STRAUSS. I don't know it of my own knowledge. It is my belief that that is a fact, sir. It is just my belief as a citizen. I haven't access to any intelligence on that subject.

Mr. JENSEN. As far as our radar screens are concerned we have every nation in the world outdistanced in a great degree. I took a trip around the world 3 years ago, and I skirted the Iron Curtain with two other Members of Congress. We talked with military officials, both ours and the high military officials of our friendly nations. We saw with our own eyes and heard with our own ears our defense setup, and I came home greatly encouraged. I only found one gate open, so to speak, during my complete trip, and we complained about it. I understand now that has been closed. So as I see it, from a layman's standpoint, any potential enemy on the other side of our defense perimeter would suffer a plenty in an attempt to break through.

Along with our striking power and our great Air Force and our Navy and the Army and the atomic development which we have, which all of us are greatly encouraged about, I don't think any potential enemy that might be mentioned would care to lock horns with us for a long time to come. But we must be ever on the alert.

Now, how far is that statement off base?

Mr. STRAUSS. Well, sir, since so much of it is based upon your personal observations on your trip, I naturally could not comment on that. I was about to make a remark similar to the one I made the other day when I was accused of being complacent about the Russians. I am far from complacent. If I were complacent, I would not be here. I think that as of 10 years ago we were inclined to underestimate them, to say that they were scientifically incompetent, that as manufacturers of planes, ships, and weapons, they were children, that today we have swung almost as far to the other extreme, and

that we are inclined to overestimate them. The supposition is that they are supermen, better planes and more of them, better weapons and more of them. That is obviously not true. The truth must rest somewhere between the extremes of those two positions. If that is what you meant by your statement, I would certainly concur with it.

With respect to a specific superiority in any particular line other than our own, with which I am familiar, I could not speak authoritatively. I believe we are ahead of the Russians in our atomic development. I think we are ahead of them in weapons production, and the application of the peaceful uses of atomic energy. That of course is based—I will have to be careful not to use the word to which the chairman objected yesterday—guestimate—that is based upon a feel, upon the reports of those who have talked with them, upon what they demonstrated in Geneva last summer, and upon some familiarity with our own situation.

REACTOR OPERATION

Mr. JENSEN. Now, just a little about reactors. Does an atomic reactor continue to breed its own power? Will you explain that? You talk about reactor breeders.

Mr. STRAUSS. By "breeding" the term applies to the fact that a reactor of a certain design with fertile material introduced either into the reactor or in a blanket around it, that fertile material captures some of the neutrons and becomes fissionable material which can be used in a reactor. In other words, "breeding" refers to the fact that fissionable material is made out of material which is not naturally fissionable, but is fertile for the production of fissionable material. A reactor does not, as I think you put it, continue to produce its own power. A reactor, to be a reactor, must continue to produce fission, that is to say, fission is a continuing process, the splitting of atoms continues until all the atoms that are fissionable have been fissioned or until enough fission products have accumulated to slow down and stop the reaction, just as, to use an analogy, just as clinkers in the firebox of a furnace will accumulate in such quantity in the firebox that the fire will go out, even though there is more coal in there to burn.

A reactor does not produce electric power. No reactors today that we know of produce electric power, except by the expedient of taking the heat, which is one of the products of a reactor, out of the reactor by means of circulating through that reactor water or liquid metal or some other conductor, or circulating the core of the reactor itself outside of the reactor through a conducting mechanism, and then using that heat to produce steam, and from that moment on the process is the orthodox process of running the steam through a turbine, running a generator from the turbine and producing electricity out of the poles of the generator.

Mr. JENSEN. I get the idea. You see, I am not a scientist by any stretch of the imagination. I do claim to be a pretty good mathematician on lower mathematics. The only college I attended was the college of hard knocks.

But that speech you gave right there would intrigue high-school pupils. They would want to learn more about it. Most of them are

mechanically minded because they are building an automobile. You take these farm boys out in the Middle West; by the time they get to be 10 years old they are pretty good mechanics.

Mr. PHILLIPS. Ten years?

Mr. JENSEN. Pretty good. These farm boys today will take an automobile down, take it all apart, go to town, get a part, put it back together and it runs as smooth as a ribbon. They did that with their tractors. They are mechanically minded.

In this field of atomic energy they would eat it up if you could inspire them. Just give them a little touch of it and they will go the whole road. You would be surprised. Of course, in Iowa, you know, we have the highest state of literacy of any State in the Union. I have to get that in. Most of the farm boys now have college degrees, as do the daughters, and we are pretty proud of them.

Now, that is a pretty good field to work in and we have great colleges out there. I am tooting the horn for my State. I should not have to do so too much because everybody knows about the great State of Iowa. But with that speech you gave right there, Mr. Strauss, I was beginning to see what a reactor will do. But I would like to know more about it. I will be 64 years old in December. I would like to know more about it.

Mr. STRAUSS. I will send you some books on the subject.

Mr. JENSEN. I would like to know more about it. It is very interesting.

Mr. Chairman, that is all.

Mr. CANNON. Mr. Magnuson.

Mr. MAGNUSON. I may be repeating, because I was not able to be here yesterday afternoon. I have another subcommittee holding hearings. But I did want to ask this question of Admiral Strauss.

DATA FOR COMPETITIVE NUCLEAR POWER

Can you give an estimate of when, if ever, electrical energy produced from nuclear sources will be able to compete from a cost standpoint with conventional sources of energy?

Mr. STRAUSS. Mr. Magnuson, there have been better qualified men than I am who have quailed before that question. It is a little more difficult to answer today than it was 10 years ago, because we are very much closer to the event. Conservatism in answering a question of that sort always becomes more pronounced when you are closer to the date, and when you can be checked up on.

I would say that the two extremes of estimates vary somewhere between the early 1960's and the late 1960's. I happen to favor the more proximate end of that spectrum. I think that electricity produced in the most modern fission reactors of that day will begin to compete with the average cost of electricity produced from the burning of coal and oil, and I specifically excepted hydropower, because, for reasons which I will touch on in a moment, that is difficult to measure. Within the first half of the next decade—I am not likely to be held to account for it, because I will not be here. The life expectancy of my family is not quite that long, but it is my belief that it will come to pass, and you will see it.

Mr. MAGNUSON. I may not be as young as you think, Admiral. Now, how about hydroelectric energy?

Mr. STRAUSS. The difference is this. Hydropower becomes less and less important in the United States because there is only a fixed amount of it. You can't continue to develop hydropower beyond the point that water is available for it. With hydropower you are burning and, in effect, you are consuming gravity, solar power. The energy of the sun has raised this water, and on its way back to sea level it passes through these generators and it is producing power. The cost of that is not a variable like the cost of coal or oil. The cost of coal in an economy like ours would presumably continue to rise unless someone discovers some far more economic method of producing it. It will continue to rise as the pay of the miner continues to rise, as transportation costs continue to rise. The same factors perhaps apply to petroleum and natural gas, although not to the same extent. But by long odds the bulk of the power produced in the United States, by the time we mention, will be produced as far as one can see now from the burning of conventional fuels and hydropower will be a smaller and smaller percentage of the total, or so the experts say.

Mr. MAGNUSON. You hear the argument sometimes that we should slow down hydrodevelopment because we are on the brink of atomic energy, inexpensive atomic energy, and that we would be wasting our effort. How do you feel about that?

Mr. STRAUSS. That does not come from the Commission. The Commission feels—I can't state this as a Commission feeling; we have never taken an action on it—I think some of the individual Commissioners share my feeling that the growth of this country, and our demand for power, is so great and will continue to be so great if we are a prosperous growing country, that every possible method of producing power must be developed.

Mr. LIBBY. Exactly.

Mr. PHILLIPS. I think I ought to call for a correction, because Admiral Strauss has several times stated in answering questions like he has answered for you that he exempted hydroelectric power on the assumption that that is cheap power. Now, there is repeated testimony before this committee that hydroelectric power is the most expensive power excepting in your area, and that probably is a possible limitation as to how long it will be there, but we will say that that is cheap. In other parts of the United States there is testimony here that hydroelectric power is actually more expensive power than most of the other kinds.

Mr. STRAUSS. I do not know of that.

Mr. PHILLIPS. I think you have been excepting it on the basis that it is cheap power.

Mr. STRAUSS. That has been my belief. I have just checked with the Director of our Division of Reactor Development to see whether he could correct me on that.

Mr. CANNON. Does the gentleman agree with that statement that, generally speaking, hydroelectric power is cheaper?

Mr. STRAUSS. I would say in principle that it should be, but it is quite obvious that others who have testified before this committee think this is not the case. My testimony on that subject must be weighted by the fact that I do not speak from knowledge.

Mr. CANNON. There is not general agreement, then.

Mr. STRAUSS. There is no general agreement.

Mr. PHILLIPS. The testimony is that it is cheaper if used for peak power but not generally; but in your area, the Northwest area, it should be considered cheap power. Otherwise, hydroelectric power is rated as high-cost power if used for general use.

Mr. JAMES C. MURRAY. When you are considering cost factors in generating power, in the range of developing our complete power potential, you have to realize that we have an exhaustible supply of coal and an exhaustible supply of oil, whereas with water you are not exhausting a resource to develop your power?

Mr. STRAUSS. My point is simply this, sir. There are a finite number of places in the country where a finite amount of water is falling from one level to another. When those are developed, no matter how much you want to have more power, you are limited by those two factors.

Mr. JAMES C. MURRAY. As I understood your statement, it is your opinion predicated on the growth we hope to achieve that we ought to develop every ounce of hydropower we can even in view of atomic development.

Mr. STRAUSS. I don't think power of that sort, which is latent, needs to be developed before it can be used economically. In the case of the development of atomic power, we must proceed now in order to be sure that we will have it as an economic affair by the time we want it. For example, there would be no purpose, in my opinion, in producing hydropower in an area where there was no consumption for it, and where it would have to wheeled for enormous distances with enormus line losses in order to get it to a consumer. That would be, in the words of half a generation ago, a boondoggling idea. Nor, for example, would I burn coal in a coal mine below the surface which has been proposed in an area where the coal was present, but where there was no demand for power at the mine pit.

Mr. MURRAY. You have answered me completely.

COMMUNITY DISPOSAL

Mr. MAGNUSON. Admiral Strauss, last year the Congress and the administration decided to get out of the business of running the town of Richland and also Oak Ridge.

Mr. STRAUSS. Yes, sir.

Mr. MAGNUSON. You are probably familiar with the fact that we have a virtual revolution on our hands out at Richland because of the prices that have been set on the property there.

Mr. STRAUSS. No, sir; I am not familiar with it. It is probably one of the thousand details in the Commission that I should know about and don't. I am sure there is someone here who does, in case you have a question.

Mr. MAGNUSON. I know it is not the primary responsibility of the Commission to set those prices.

Mr. CANNON. Can you supply that information?

Mr. STRAUSS. Does the General Manager have the answer to the question.

Mr. FIELDS. I am not sure what the question is.

Mr. MAGNUSON. The question is, Do you have the same problem at Oak Ridge as you have at Richland, the people protesting the prices which were set on their housing and commercial property?

Mr. FIELDS. As I understand at the moment, there have not been meetings in protest at Oak Ridge that there were at Hanford. I think they are waiting to see whether there will be congressional action with respect to this in the form of resolution or some other action. A Subcommittee on Community Affairs of the Joint Committee on Atomic Energy has been holding hearings this week, I believe, on this subject. It arises, as, of course, you know, from the appraisals that were made by the Federal Housing Administration and as to which the local population believes some of the values, or a good many of the appraisals, are too high.

Mr. MAGNUSON. The only other question is, What is the attitude of the responsible people in the Commission who are familiar with this toward this controversy, and toward the appraisals which have been made by the Housing and Home Finance Agency?

Mr. FIELDS. We are very much concerned about the problem, and we are working with the joint committee on this qustion as closely as we can. I know they are intending to hold hearings with respect to these appraisals themselves. As you know, we have not been responsible for the appraisals. There is a difference in the book value of the houses on our books, depreciated value, as against the appraisals here, and that amounts to something of the order of $10 million overall.

Mr. MAGNUSON. Which way does that difference run?

Mr. FIELDS. If you were to take the book values and sell the houses on that basis, if the houses were to be sold on the basis of book values, I understand the return to the Government would be something on the order of $10 million less than on the basis of the appraised values. I would like to check this figure for accuracy and give it for the record. That is approximate.

Mr. MAGNUSON. On a rough guess, how much would that run per house?

Mr. FIELDS. I don't know.

Mr. PHILLIPS. Out of how large a total, Mr. Magnuson?

Mr. FIELDS. I do not have the data on that, sir, at the moment. Mr. Ohlke has some information on the number of houses.

Mr. OHLKE. There are 4,804 single and duplex houses to be sold at Richland. However, these houses vary, as you know, from your prefabs up to your better frame houses.

Mr. FIELD. Do you have the total estimated face value?

Mr. BLOCH. $52 mililon at Richland for both houses and commercial property.

Mr. FIELD. $52 million for both houses and commercial property.

Mr. MAGNUSON. Do you have the figure for how much of it was commercial?

Mr. FIELDS. No, sir; I do not. I can furnish that.

(The following was submitted later.)

The portion of the total appraisal representing commercial and industrial property is $5,822,150.

Mr. MAGNUSON. I want to express myself. I think where there is as loud an outcry as has risen in this case, I am convinced that the figures are out of line. I certainly hope there will be some adjustment.

That is all, Mr. Chairman.

Mr. PHILLIPS. I don't think you can divide $52 million by 4,804 and get the figure we are asking. Do you have that separated, either a total figure or figure between housing and commercial property?

Mr. FIELDS. Do you have that available, Mr. Ohlke?

Mr. OHLKE. Yes, I do. The figure I gave was only on the single and duplex houses. In addition there would be commercial property and apartments to be sold.

Mr. FIELDS. Do you have those in terms of dollars for the houses, the appraised value?

Mr. OHLKE. Not with us; no, sir.

Mr. PHILLIPS. I think that is impossible, Mr. Magnuson, because that would make a difference on the individual house of over $9,000.

Mr. MAGNUSON. This $52 mililon as I understand it includes the commercial property.

Mr. PHILLIPS. I understand the gentleman back there said it does not.

Mr. FIELDS. It does. I believe it is of the order of a thousand or two thousand dollars in the case of individual units or even higher sometimes. We will supply that for the record.

The Commission is very concerned about this. We feel there should be a solution to this, that it cannot go on long or it will definitely affect the morale and the performance of the work there.

Mr. MAGNUSON. I am sure you are correct. The effect on the morale out there already is very serious. I am quite confident that there will be adjustment as a result of congressional action, but I wanted to get some notion of the attitude of the Commission on this.

That is all, Mr. Chairman.

EIGHT CLASSES OF REACTORS

Mr. CANNON. Mr. Strauss, by way of summary, you have told us there are eight general classes of reactors. Which of these classes, if any, is now in full demonstration in either England or Russia?

Mr. STRAUSS. I don't know that there is any in full demonstration in England. There is in Russia, we believe, since we have been shown motion pictures of it, a small—that is to say, 5,000-kilowatt—graphite-moderated water-cooled reactor of a type which I think we would characterize the model T Ford. We haven't anything running that is that much of an antique.

Mr. CANNON. Would you say they are to that extent ahead of us?

Mr. STRAUSS. No, sir. We have had running at Arco the prototype of a reactor on the *Nautilus*. That has been operating since the summer of 1953. The *Nautilus* itself has been at sea for over a year. The prototype of the reactor on the *Seawolf*, a liquid metal cooled reactor, has been in operation at West Milton, N. Y., for nearly 2 years, and the seagoing reactor itself has been installed on the *Seawolf*. There are a number of other reactors around the country in various laboratories and universities that are operating.

Mr. CANNON. All of them fall within 1 of the 8 classes to which you refer?

Mr. STRAUSS. Would you say that the eight different categories would cover them, Dr. Davis.

Mr. DAVIS. Yes.

Mr. CANNON. There are now five. You are asking for three more. That is a total of 8, 1 for each general class.

Mr. FIELDS. Essentially there are 3 additional endeavors starting with this budget which makes 8 basic concepts.

Mr. CANNON. We are told that England is now building and is nearing completion of an additional class of reactor that does not fall within any of these categories.

Mr. STRAUSS. That is right.

Mr. CANNON. What is the comparative situation there?

Mr. STRAUSS. That is a reactor, Mr. Chairman, which is designed to produce plutonium, weapons material. The heat from that reactor instead of being vented in the Columbia River, as our reactors which are plutonium producers in Hanford, or into the Savannah River, as our reactors in South Carolina do, that heat is used to produce power. But since the reactor is a plutonium producer and not designed to produce power primarily as these eight we are discussing are, heat is a very expensive byproduct.

Mr. CANNON. Would you say the objective of the English plant is to produce a cheaper and a more efficient class of power than the reactors we are contemplating?

Mr. STRAUSS. No; absolutely to the contrary.

Mr. CANNON. Their idea then is speed and volume rather than economy?

Mr. STRAUSS. Their idea is to produce weapons and they do not waste the heat that is incident to that.

Mr. CANNON. Such a plant designed to produce weapons could not be adapted to commercial development?

Mr. STRAUSS. Not in this country, because the power would be too expensive.

Mr. CANNON. In England where there is lack of coal and other fossil fuel, time is a more important element than in this country, and expense is a less important factor?

Mr. STRAUSS. That is the argument which they have made to their Government not on the basis of which their Government has undertaken the program based on their statement to me.

Mr. CANNON. You tell us that it is important that we be first in the field of production of commercial power at competitive rate. Is that for the sake of prestige, or is that for the sake of actual competitive advantage?

Mr. STRAUSS. No, sir; because as far as prestige is concerned, we are far ahead of anyone in the production of power. As I say, we have been producing many thousands of horsepower. The figure is only classified because the shaft horsepower of the submarine is a military item.

Mr. CANNON. You are taking steps to preserve that lead?

Mr. STRAUSS. Yes.

Mr. CANNON. You think we are in a position to preserve that lead?

Mr. STRAUSS. I believe so, sir. In fact, I am confident we will.

In discussing the relatively lower cost of hydro power than other power, in answer to your question, sir, I perhaps overlooked stating an obvious thing. That is to say, an important part of the cost of power is the cost of capital investment of the plant. When a part of that capital investment can be attributed to flood control or irrigation,

obviously you have a reduced figure to offset the cost of power. Since that is an arbitrary figure, one should not take powerplants in which there is an irrigation or flood control feature as typical of the cost of hydro power. Perhaps that was apparent to all, but I thought I ought to mention it for the sake of the record.

M'KINNEY REPORT

Mr. CANNON. Admiral Strauss, you are familiar with the Robert McKinney report?

Mr. STRAUSS. Yes, sir; I have read it.

Mr. CANNON. What is your appraisal of the McKinney report?

Mr. STRAUSS. In general, sir, I thought it was a very fine, unbiased, temperate approach. With most of its recommendations we concurred. Many of them, as a matter of fact, were recommendations of things which the Commission had already put into effect some months before the report was rendered. There are some recommendations in the report which we consider either premature or impracticable or with which we disagree.

Mr. CANNON. Briefly, in what respect if at all do you take issue with the McKinney report?

Mr. PHILLIPS. May we have the name of the report again?

Mr. STRAUSS. McKinney. The McKinney panel was a panel that was appointed by the chairman of the Joint Committee, by Senator Anderson, under the chairmanship of Mr. Robert McKinney, the owner and publisher of the newspaper in Santa Fe, N. Mex.

Mr. CANNON. It was financed by Federal funds.

Mr. STRAUSS. They did have an appropriation. They engaged engineers and those engineers were paid out of our funds.

Mr. PHILLIPS. Was it an efficiency report?

Mr. STRAUSS. In general it dealt with matters that we would have had to look into ourselves. I would not call it an efficiency report.

Mr. PHILLIPS. Procedural?

Mr. STRAUSS. I could not, Mr. Phillips, characterize it by adjectives.

Mr. CANNON. It dealt with matters of policy?

Mr. STRAUSS. As a matter of fact, not having read the report itself, I am incompetent to——

Mr. CANNON. I am surprised.

Mr. STRAUSS. I read the McKinney report. I did not read their basic documents. They were not available to me.

Mr. CANNON. You do consider this report a contribution in this field?

Mr. STRAUSS. I do.

Mr. CANNON. You told us this morning that we must achieve our essential objectives within the next 5 years.

Mr. STRAUSS. That was with respect to the educational field sir. I had the feeling that if we do not reverse the trend within 5 years we may never be able to overtake the Russians in terms of the numbers of people that they will have trained. It did not have any other connotation than that, the 5 years.

Mr. CANNON. You would say to that extent it is a crash objective?

Mr. STRAUSS. In training I believe we should exert every effort. I don't know whether crash is a good adjective for it. I would

accept it except I don't like the term; just as you don't like "guestimate," I don't lake "crash."

Mr. CANNON. I note, Admiral Strauss, that the McKinney report says that in order to keep our leadership—evidently he believes we are in a race to keep our leadership:

> The United States must develop the resources of atomic energy, especially of power, at high priority.

Could that be considered a crash program, a matter of high priority.

Mr. STRAUSS. I think the crash program might be interpreted as the highest of all priorities. But at high priority is the way in which we come to you in order to get appropriations to develop it. That is right, sir.

Mr. CANNON. Now, this report also tells us that if we do not provide this service, others will. He goes on to reach this conclusion:

> That a broad atomic assistance program must be made an integral part of our structure of international relations.

Do you agree with that?

Mr. STRAUSS. I do, and we are very active in that field.

Mr. CANNON. He also says that demonstration plants must be built. Is that part of your program in this budget? Is this budget submitted for the purpose of providing demonstration plants for each of these classes of atomic reactors? He further says:

> We must have a domestic demonstration program.

Is this the plan which you are presenting today, and is it included in the purpose for which you are asking appropriations? Would you consider this a domestic demonstration program?

Mr. STRAUSS. We do, sir, and we coined the phrase ourselves.

PROPOSED DEMONSTRATION PLANTS ABROAD

Mr. CANNON. The report goes on to say that the places to build additional demonstration plants are in those regions abroad where the cost of conventional power is high and where atomic power is most likely to pay its own way. From your discussion this morning, are we to conclude, for example, that Britain is one of those places?

Mr. STRAUSS. Yes; but we would not be obviously, the United States would not be building a demonstration plant in Britain.

Mr. CANNON. It is not your intention then, and you do not think it is part of the program of the mutual assistance and the foreign aid program to include funds for such a demonstration plant abroad?

Mr. STRAUSS. I could not answer for the mutual assistance program, sir, because I think that circumstances might arise where from a political point of view they might recommend to you that the United States Government should erect a plant—I am picking this out of the air, sir, in the East Indies, in the Philippines, in Malaya, but from the point of view of the Atomic Energy Commission and the development of atomic power, we see no purpose in building an atomic energy plant of an experimental nature in a remote country which is power shy because any plant that we develop, as was testified here yesterday, we could not be certain of firm power from it for a period of 3 or more years. Therefore, it would not be of any service to the country in which it was built, nor could we export in the present con-

dition of our own shortage of technicians. Nor could we export the scientists and the technicians to remain with and to operate such a plant indefinitely. In Mr. McKinney's report, sir, that proposal which you just mentioned does not occur. It does occur in a speech he made to the Overseas Press Association, and he had discussed it with me before making that proposal. He understands quite fully, and I think intelligently and sympathetically, what we regard as the impracticability of erecting a large number of demonstration plants in countries with limited technical ability, with the hazards of such plants not only to the people inhabiting such a country, but to the people in surrounding countries, if a plant were given to a foreign country which did not have technicians, unless we supplied them to construct and operate it.

Now, in the state of affairs in which we found ourselves, we can export material but we cannot export bodies.

Mr. CANNON. Apparently, then, Admiral Strauss, there is no national program at this time, and no administration program, and there is no provision made in the budget before us to carry out this recommendation of the McKinney panel?

Mr. STRAUSS. No, sir; that was not a recommendation of the McKinney committee, as I understand it. That was not included, I believe, in his panel report, but is a suggestion he made subsequently in the course of various public addresses that he has delivered. That represents his own view.

Mr. CANNON. You say you are not in a position to speak on mutual assistance or on foreign aid.

Mr. STRAUSS. I think I should not.

Mr. CANNON. The statement is made in this report that—

An international atomic power demonstration program would salvage at moderate cost—

I am glad to note that this thing is not a matter of excessive expense—

would salvage at moderate cost the billions we have invested in foreign aid and would help to meet the Soviet threat.

That might be considered a very laudable objective.

Mr. STRAUSS. It is, indeed.

Mr. CANNON. To what extent are you, and the Commission, supporting a policy which would carry out that recommendation?

Mr. STRAUSS. Let us take the Sudan, which, for example, it has been suggested that we should build a very large powerplant in the Sudan with American capital. Suppose we do so at the expenditure of a very considerable amount of money, and suppose we also agreed to send the people over to operate it.

Mr. CANNON. Are you referring to the Aswan Dam proposition?

Mr. STRAUSS. No.

Mr. CANNON. Would the Aswan Dam come within this category?

Mr. STRAUSS. No; let us pick another country that does not involve this complication. Let us say Lebanon, any country that is remote, that has a relatively low level of literacy and a low standard of economic development, and is power shy. We build a big plant to demonstrate atomic power. That is only the beginning of the cost, because that power is of no value to those people unless you build transmission lines, and the transmission lines are of no value unless at the end of those lines where the consumers are there are motors to be turned,

and those motors are of no value unless they are in plants where they are producing some useful work. So that what is being discussed, namely, the cost of the atomic powerplant, is a quite small percentage of the total that would make any economic impact.

Mr. CANNON. This concludes our morning session. Admiral Strauss, we will excuse you and the members of the Commission at this time. We will this afternoon at 2 o'clock take up with the Manager the budget in detail. Please feel at liberty to elaborate on any testimony you have given and of course to eliminate any classified matter.

We very much appreciate your attendance here, and your cooperation. With regard to your educational program, may I suggest that you drop a little lower in our primary system. We have a rapidly growing Boy Scout movement which is exercising a notable influence on the boys at the formative period in their lives. It occurs to me if this proposition were included as one of the steps in scout craft and were reduced to language which would be understandable to the average boy of that age, it might exercise a beneficial influence.

Mr. STRAUSS. That is another idea that we did not think of. The parent-teachers association and the Boy Scouts are absolutely two thoughts that had not occurred to us. May I say that never in my experience have I appeared before a chairman of a legislative committee that has been as patient and considerate as you have been, and given us every opportunity to present our case. Speaking personally on behalf of my colleagues and our associates, we are very grateful for it.

Mr. CANNON. The Committee will adjourn until 2 o'clock this afternoon.

AFTERNOON SESSION

BUDGET FOR THE ATOMIC ENERGY COMMISSION, 1957

Mr. CANNON. We will take up in detail the budget for the Atomic Energy Commission. General Fields, the Manager, is with us this afternoon. General Fields, do you care to make a statement at this time?

Mr. FIELDS. I have no prepared statement, sir. I have some remarks to make before we get into the details of the budget.

Mr. CANNON. We shall be glad to hear from you.

EXPLANATORY STATEMENT

Mr. FIELDS. Our request, as you know, Mr. Chairman, is set forth in two appropriations, an appropriation for operating funds and an appropriation for plant funds. This has been presented in the documents before you. You will have three books that pertain to this. Actually only two of them need we deal with. Book 1 contains the operating budget, the appropriations for operating expenses; and book 2, which is the capital budget, contains the appropriation request for plant acquisition and construction. These are the two green books.

You also have a buff-colored book which is the amendment that was processed on May 29 by the President. These amendments have been incorporated into the green books so that the amended budgets reflect the total amounts of that request. In these books you will find white pages as in the past which are the unclassified justifications, and these can be inserted in the record as you wish.

The green sheets in the books contain more detailed justification that requires the use of classified information to make them fully adequate for your purposes, but the white sheets are completely unclassified, and can be inserted in the record as we go through.

With that, sir, I invite your attention to the operating budget, and I would propose, with your permission, to deal first with the operating program. Following that, we will turn to the plant acquisition and construction budget.

First is book 1, the operating budget, and I would suggest, Mr. Chairman, that the first 8 pages thereof be inserted in the record at this time. These are general summaries with respect to the overall operating budget. I would like to make some remarks with respect to page 3 thereof.

JUSTIFICATION OF THE ESTIMATES

Mr. CANNON. Pages 1 to 8, inclusive, of the justification, will be inserted in the record at this point.

(The information is as follows:)

SUMMARY OF AMENDED BUDGET ESTIMATES FOR ATOMIC ENERGY COMMISSION, FISCAL YEAR 1957

The following table shows a comparison of appropriations, obligations, expenditures, and year-end unexpended balances under appropriations to the Atomic Energy Commission.

	Actual fiscal year 1955	Estimate fiscal year 1956	Estimate fiscal year 1957
Appropriations:			
Operating expenses	$1,098.9	$575.0	$1,740.4
Plant acquisition and construction	110.9	259.2	158.3
Total	1,209.8	834.2	1,898.7
Obligations: [1]			
Operating expenses	850.2	1,500.5	1,780.4
Plant acquisition and construction	249.0	391.1	306.6
Total	1,099.2	1,891.6	2,087.0
Expenditures:			
Operating expenses	1,038.7	1,395.0	1,667.0
Plant acquisition and construction	818.7	280.0	313.0
Total	1,857.4	1,675.0	1,980.0
Unexpended balances at end of year:			
Operating expenses	902.2	653.6	727.0
Plant acquisition and construction	1,328.3	736.1	581.4
Total	2,230.5	1,389.7	1,308.4

[1] Includes comparability transfer to Operating Expenses from Plant Acquisition and Construction for equipment in amount of $49.2 million.

GENERAL STATEMENT FOR OPERATING EXPENSES

Estimate of appropriation

This book contains the budget estimates for the appropriation "Operating expenses, Atomic Energy Commission" for fiscal year 1957, as amended by House Document 415, 84th Congress, 2d session. The estimates provide for total obligations of $1,780,400,000 to be funded by (1) a new appropriation of $1,740,400,000, and (2) the reappropriation of $40 million in unobligated balances remaining at the end of fiscal year 1956.

Estimates of costs and obligations

The estimates for the appropriation, "Operating expenses," are stated in terms of accrued costs for each of the AEC's major operating programs. "Accrued costs" denotes the actual application of labor, materials, equipment, and services to the program during the year, but excludes depreciation of facilities used in the operation. The AEC does, however, maintain accounts for depreciation for the purpose of determining total costs of production and for use in establishing prices for services rendered on products sold to others.

Revenues are obtained from the operation of AEC-owned communities and housing, from the sale of products and services performed for others, and from other miscellaneous sources. These revenues are shown separately under the section titled "Revenues applied," and are deducted from the total costs in determining the amount of the net costs to be financed.

The net costs of operation are reconciled to the total obligations to be incurred during the year by estimating the buildup or decrease during the year of the resources that are to be applied to future years' operations. These estimates are included in the section titled "Increase or decrease (—) in selected resources" and include inventories and undelivered orders.

The table on the next page summarizes the accrued costs for each program and the total obligations for the fiscal years 1955, 1956, and 1957. The detailed justifications beginning on page 9 present the programs in the same order as they appear on this summary table.

Summary of accrued operating costs by program reconciled to obligations

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Accrued costs:			
Source and special nuclear materials	$626,896,217	$846,524,000	$1,012,582,000
Weapons	238,184,541	262,739,000	299,370,000
Reactor development	109,155,473	172,127,000	285,335,000
Physical research	44,548,999	52,619,000	65,093,000
Biology and medicine	28,120,416	29,172,000	31,527,000
Community	18,977,296	20,065,000	17,950,000
Program direction and administration	33,953,408	38,016,000	39,427,000
Security investigations	9,817,431	6,807,000	6,610,000
Other costs	−10,360,343	5,270,000	6,375,000
Total accrued costs	1,099,293,438	1,433,339,000	1,764,869,000
Revenues applied	−17,167,446	−30,226,000	−33,797,000
Net accrued costs	1,082,125,992	1,403,113,000	1,731,072,000
Increase or decrease (−) in selected resources	−231,957,950	97,393,772	49,328,000
Total obligations for operating expenses	850,168,042	1,500,506,772	1,780,400,000

Financing of obligations

The fiscal year 1957 budget estimate proposes that the obligations for fiscal year 1957 totaling $1,780,400,000 be financed (1) by new appropriations totaling $1,740,400,000, and (2) by the reappropriation of $40 million in unobligated balances remaining at the end of fiscal year 1956. Obligations in fiscal years 1955 and 1956 were financed in part by new appropriations, and by transfers from other appropriations and by the reappropriation of unobligated balances of prior-year appropriations. The following table summarizes the financing of obligations for fiscal years 1955, 1956, and 1957:

	Fiscal year 1955	Fiscal year 1956	Fiscal year 1957
Appropriation	$1,098,962,300	$575,000,000	$1,740,400,000
Unobligated balance:			
Available at beginning of year	74,661,382	[1] 344,931,772	40,000,000
Available at end of year	[1] −344,931,727	−40,000,000	0
Transfer from "Plant and equipment, AEC"	0	571,400,000	0
Comparative transfer from "Plant and equipment, AEC"	21,476,087	49,175,000	0
Obligations	850,168,042	1,500,506,772	1,780,400,000

[1] Difference of $45 represents transfer during fiscal year 1955 from "Consolidated working fund, Army."

Expenditures for operating expenses

Expenditures for operating expenses for fiscal year 1957 are estimated at $1,667 million, an increase of $272 million over the estimate of $1,395 million in fiscal year 1956. Actual expenditures for operating expenses in fiscal year 1955 totaled $1,038,679,648. Unexpended balances are expected to decrease from $841,926,550 at the beginning of fiscal year 1955 to an estimated $727,009,202 at the end of fiscal year 1957, as shown in the following table which depicts the amounts available for expenditure, the expenditures for each year, and the unexpended balances at the end of each year.

	Actual fiscal year 1955	Estimate fiscal year 1956	Estimate fiscal year 1957
Unexpended balance, beginning of year	$841,926,550	$902,209,202	$653,609,202
Appropriation	1,098,962,300	575,000,000	1,740,400,000
Transfer "Plant and equipment"	0	571,400,000	0
Total funds available	1,940,888,850	2,048,609,202	2,394,009,202
Expenditures (deduct)	1,038,679,648	1,395,000,000	1,667,000,000
Unexpended balance, end of year	902,209,202	653,609,202	727,009,202

Highlights of operating programs

As shown in the table on page 3, estimates are prepared and presented for (1) each of the Commission's major operating programs, (2) revenues, and (3) change in selected resources. The highlights of each of these estimates are:

Operating costs

1. *Source and special nuclear materials program.*—Operating costs for the source and special nuclear materials program are estimated at $1,012.6 million in 1957, compared with the estimated 1956 costs of $846.5 million and actual 1955 costs of $626.9 million. The production of source and special nuclear materials begins with the exploration for and procurement of uranium ore and concentrates, which are refined into feed materials for gaseous diffusion plants or reactors. The isotope uranium–235 is extracted in gaseous diffusion plants at Oak Ridge, Tenn.; Paducah, Ky.; and Portsmouth, Ohio. Plutonium is synthesized in the reactors at Hanford, Wash., and Savannah River, S. C. The amounts of these special nuclear materials produced are the limiting factor in the production of atomic weapons.

The substantially increased quantities of uranium concentrates to be procured in 1957 will include materials from such foreign sources as South Africa, Australia, Belgian Congo, Canada, and Portugal. Domestic production of uranium concentrates in the Western States will continue to increase, as well as the recovery of byproduct uranium being undertaken by the domestic phosphate industry.

As new facilities come into operation for the production of feed and special nuclear materials sharply increased output will be accompanied by lower unit processing costs. Development of new equipment and processes for each manufacturing step is aimed at still further increases in yield and improvements in the quality of products.

2. *Weapons program.*—Operating costs for the weapons program are estimated at $299.4 million in 1957, compared with estimated 1956 costs of $262.7 million and actual 1955 costs of $238.2 million. The weapons program includes the

production of atomic weapons, the development, design, and testing of new weapon types, and the maintenance of stockpiled weapons in a state of constant readiness. Weapon testing will continue at the test sites in Nevada and the Pacific islands, as developments may warrant.

3. *Reactor development program.*—Operating costs for the reactor development program are estimated at $285.3 million in 1957 compared to estimated 1956 costs of $172.1 million and actual 1955 costs of $109.2 million.

Increased emphasis will continue to be placed on advancing power reactor technology, in order to assist industry ultimately to achieve large-scale generation of economic electrical energy from atomic reactors. The rate of progress toward this objective will be further accelerated in 1957.

Research and development will be conducted on an increasing scale in 1957 on reactors to propel naval vessels and military aircraft and to meet military needs for heat and power in remote areas. This research also provides information useful in the development of civilian power reactors.

The estimates also cover advanced engineering and development, applicable to many reactor designs, on reactor materials and components, systems for heat transfer, shielding, and chemical processing; operation of experimental facilities at the national reactor testing station in Idaho; and a program of training and education in the nuclear engineering sciences.

4. *Physical research program.*—Operating costs for physical research are estimated at $65.7 million in 1957 compared with estimated 1956 costs of $52.6 million and actual 1955 costs of $44.5 million. The physical research program consists of theoretical and experimental investigations required to support both the Commission's immediate and longer range objectives for utilizing nuclear energy. Every advance achieved in the past can be traced back to similar laboratory investigations. In the atomic energy program, research plays a relatively more important role than in other industrial operations of comparable size. The phenomena dealt with are close to the frontiers of science. Unusual materials are employed, and their nuclear as well as their chemical and physical properties must be determined. The temperatures and radiation densities at which these materials are used are outside the range of previous experience in industrial technology.

Research is carried on both by Commission laboratories and by some 100 universities and other independent institutes.

5. *Biology and medicine program.*—Operating costs for biology and medicine are estimated at $31.5 million for 1957, compared with estimated costs of $29.2 million in 1956 and actual costs of $28.1 million in 1955. Primary program emphasis will continue to be placed on the protection of the health and safety of atomic energy plant workers and the general populace from the hazards of atomic energy operations. While program direction will be in fulfillment of requirements developed under production and weapons testing operations, additional emphasis will be placed on research efforts of pertinence in the rapidly growing field of industrial uses of atomic energy, as well as for atoms for peace. Technical guidance and standards will continue to be furnished for the safety and health aspects of production and weapons test activities. Close liaison will continue to be maintained with the Federal Civil Defense Administration as well as with other agencies performing functions interrelated with Commission biomedical interests.

6. *Community operations.*—The Commission operates under contract the communities of Los Alamos, N. M., Oak Ridge, Tenn., and Richland, Wash., and provides limited housing services at Sandia, N. M., and in the uranium mining area. Based on anticipated disposal of a substantial proportion of AEC-owned real estate at Oak Ridge and Richland and resultant reductions in requirements for property maintainance the estimates for fiscal year 1957 reflect a reduction in operating costs. Estimated costs of $17.9 million will be incurred in fiscal year 1957 for community operations compared with estimated fiscal year 1956 costs of $20.1 million and actual fiscal year 1955 costs of $19.0 million.

7. *Program direction and administration.*—Under the general heading of program direction and administration are grouped together the salary costs and other expenses of Commission personnel engaged in general management, executive direction, and technical supervision of program operations; the negotiation and administration of contracts; and other related administrative activities. The corresponding costs for Commission personnel engaged in nonadministrative activities directly related to a specific program are included in that program, as for example, personnel safeguarding classified shipments or providing fire protection for a community. Expenses of personnel and travel of other Govern-

ment agencies doing work for the Commission under working fund advances are treated as contractual services, are not included in the AEC detail of personal services and travel, and are not included in limitation amounts.

The Commission administers its widely scattered operations through the Washington headquarters office, 10 operations offices, and 15 area offices. Estimated costs of $39.4 million will be incurred in fiscal year 1957 for program direction and administration, compared with estimated fiscal year 1956 costs of $38 million and actual fiscal year 1955 costs of $34 million. The increase of $1.4 million in fiscal year 1957 costs provides for a higher average level of employment in support of accelerated development of civilian and military reactors, other civilian and industrial applications of atomic energy, the international cooperation program, and a continued all-out effort in the development, production, and stockpiling of atomic weapons for defense. The costs in fiscal year 1957 represent 2.2 percent of total operating costs, compared with an estimated 2.6 percent in fiscal year 1956 and 3.1 percent in fiscal year 1955.

8. *Security investigations.*—Estimated costs of security investigations in fiscal year 1957 are $6.6 million, compared with estimated fiscal year 1956 costs of $6.8 million and actual fiscal year 1955 costs of $9.8 million. Under provisions of the Atomic Energy Act persons to be employed on work involving access to restricted data are required to be cleared for security purposes based on investigations by the Civil Service Commission or the Federal Bureau of Investigation.

9. *Other costs.*—Costs are incurred in furnishing materials and rendering services to industrial and research organizations through the civilian application activities of the Commission. Estimated costs of $6.4 million will be incurred in fiscal year 1957 compared with estimated fiscal year 1956 costs of $5.3 million and actual fiscal year 1955 costs of —$10.4 million. Fiscal year 1955 costs include adjustments for prior years of —$11.4 million.

10. *Revenues applied.*—Revenues are obtained from the operation of communities, from the sale of materials and services to others, principally, in extending assistance to industry, and from other miscellaneous sources. Revenues are estimated at $33.8 million in fiscal year 1957, an increase of $3.6 as compared with fiscal year 1956. This reflects the application of receipts previously deposited with the United States Treasury against AEC appropriation requirements and increased returns from sales of products and services. Revenues are $30.2 million for fiscal year 1956, as compared with $17.2 million in fiscal year 1955, an increase of $13 million, reflecting increased income from products and services sold.

11. *Selected resources.*—Includes inventory stocks held by the AEC and its contractors, collateral funds, and goods and services on order or under contract. The appropriation requirements for these items are based on the changes in balances from the previous fiscal year.

Unapplied resources at the end of fiscal year 1957 are estimated at $765.2 million as compared with $715.9 million in fiscal year 1956 and $618.5 million in fiscal year 1955. The increase of $49.3 million in fiscal year 1957 is required for additional stocks of inventories required for new and enlarged production and laboratory facilities and an increase of goods and services on order primarily under the weapons and reactor development programs.

Operating Expenses

Program and financing

	In budget	Revised estimate	Difference
Program by activities:			
1. Source and special nuclear materials	$1,012,582,000	$1,012,582,000	
2. Weapons	282,470,000	299,370,000	$16,900,000
3. Reactor development	234,935,000	285,335,000	50,400,000
4. Physical research	65,693,000	65,693,000	
5. Biology and medicine	31,527,000	31,527,000	
6. Community	17,950,000	17,950,000	
7. Program direction and administration	38,327,000	39,427,000	1,100,000
8. Security investigations	6,610,000	6,610,000	
9. Other costs	6,375,000	6,375,000	
Total costs	1,696,469,000	1,764,869,000	68,400,000
10. Revenues applied	−33,797,000	−33,797,000	
Net costs	1,662,672,000	1,731,072,000	68,400,000
11. Relation of costs to obligations: Increase or decrease (−) in selected resources available for future application to activity costs	29,328,000	49,328,000	20,000,000
Total obligations	1,692,000,000	1,780,400,000	88,400,000
Appropriation	1,672,000,000	1,740,400,000	68,400,000
Reappropriation	20,000,000	40,000,000	20,000,000

Obligations by objects

Object classification	In Budget	Revised estimate	Difference
ATOMIC ENERGY COMMISSION			
01 Personal services	$43,300,000	$44,150,000	$850,000
02 Travel	3,300,000	3,350,000	50,000
03 Transportation of things	5,730,634	5,743,634	13,000
04 Communication services	2,973,520	3,003,520	30,000
05 Rents and utility services	230,123,376	230,123,376	
06 Printing and reproduction	434,320	434,320	
07 Other contractual services	917,389,065	1,004,706,065	87,317,000
Services performed by other agencies	11,225,545	11,225,545	
08 Supplies and materials	407,627,964	407,647,964	20,000
09 Equipment	43,500,000	43,620,000	120,000
11 Grants, subsidies, and contributions	733,000	733,000	
13 Refunds, awards, and indemnities	110,100	110,100	
15 Taxes and assessments	5,029	5,029	
Unvouchered	100,000	100,000	
Total, Atomic Energy Commission	1,666,552,553	1,754,952,553	88,400,000
Allocated working funds with other agencies	25,447,447	25,447,447	
Grand total	1,692,000,000	1,780,400,000	88,400,000
Average salaries and grades: Grades established by the Atomic Energy Commission equivalent to general schedule grades:			
Average salary	$5,448	$6,054	$6,169
Average grade	GS-8.0	GS-8.3	GS-8.3

Detail of personal services

	In budget		Revised estimate		Difference	
	Number	Total salary	Number	Total salary	Number	Total salary
ATOMIC ENERGY COMMISSION						
Departmental:						
Grades established by the Atomic Energy Commission which are equivalent to general schedule grades:						
GS–15. Range $11,610 to $12,690:						
Section chief	5	$58,050	7	$81,270	2	$23,220
Special assistant	13	155,250	16	190,080	3	34,830
GS–14. Range $10,320 to $11,395:						
Foreign affairs officer	1	10,535	3	31,175	2	20,640
Liaison officer	2	21,715	6	62,995	4	41,280
Metallurgist	1	10,750	2	21,070	1	10,320
Physicist	5	52,245	7	72,885	2	20,640
Scientific analyst	6	62,995	8	83,635	2	20,640
Special assistant	3	31,175	4	41,495	1	10,320
GS–13. Range $8,990 to $10,065:						
Chemist	2	18,410	4	36,390	2	17,980
Engineer	26	239,975	33	302,905	7	62,930
Foreign affairs specialist	2	18,195	4	36,175	2	17,980
Industrial management officer	8	72,135	9	81,125	1	8,990
Labor relations officer	1	9,205	2	18,195	1	8,990
Liaison officer	6	55,875	7	64,865	1	8,990
Physicist	6	55,660	9	82,630	3	26,970
Program analyst	7	65,080	9	83,060	2	17,980
Reports analyst	1	9,205	2	18,195	1	8,990
Technical writer	1	9,850	2	18,840	1	8,990
GS–12. Range $7,570 to $8,645:						
Chemist	2	15,140	4	30,280	2	15,140
Engineer	6	47,570	16	123,270	10	75,700
Foreign affairs officer	3	22,710	4	30,280	1	7,570
Procedures analyst	2	15,140	4	30,280	2	15,140
Program analyst	1	7,785	11	83,485	10	75,700
Scientific analyst	2	15,140	6	45,420	4	30,280
GS–11. Range $6,390 to $7,465:						
Foreign affairs officer	4	25,755	7	45,140	3	19,385
Program analyst	6	38,340	7	44,730	1	6,390
Special assistant	1	6,820	3	19,600	2	12,780
GS–7. Range $4,525 to $5,335	91	455,840	93	464,890	2	9,050
GS–5. Range $3,670 to $4,480	251	1,026,045	271	1,099,580	20	73,535
GS–4. Range $3,415 to $3,925	132	490,060	155	568,605	23	78,545
GS–3. Range $3,175 to $3,685	55	199,585	59	212,455	4	12,870
All other positions	863	7,510,455	863	7,510,455		
Total permanent, departmental	1,515	10,832,690	1,637	11,635,455	122	802,765
Deduct:						
Lapses	47	355,957	108	757,342	61	401,385
Excess civilian pay over military	36	399,270	36	399,270		
Net permanent, departmental (average number, net salary)	1,432	10,077,463	1,493	10,478,843	61	401,380
Positions other than permanent:						
Temporary employment		3,978		3,978		
Intermittent employment		109,353		109,353		
Payment above basic rates:						
Overtime and holiday pay		105,215		105,215		
Nightwork differential		1,200		1,200		
All personal services, departmental		10,297,209		10,698,589		401,380
Field:						
Grades established by the Atomic Energy Commission which are equivalent to general schedule grades:						
GS–14. Range $10,320 to $11,395:						
Engineer	23	244,240	25	264,880	2	20,640
Project officer	9	94,170	11	114,810	2	20,640
GS–13. Range $8,990 to $10,065:						
Chemist	4	37,035	8	72,995	4	35,960
Contract administrator	5	45,380	7	63,360	2	17,980
Engineer	90	841,135	115	1,065,885	25	224,750
Metallurgist	3	27,615	7	63,575	4	35,950
Production analyst	1	9,420	4	36,390	3	26,970
Project officer	13	116,870	16	143,840	3	26,970
Scientific analyst	3	28,045	5	46,025	2	17,980

Detail of personal services—Continued

	In budget		Revised estimate		Difference	
	Number	Total salary	Number	Total salary	Number	Total salary
Field—Continued						
Grades established by the Atomic Energy Commission—Continued						
GS–12. Range $7,570 to $8,645:						
Accountant	30	$242,580	35	$280,430	5	$37,850
Attorney	11	84,775	14	107,485	3	22,710
Auditor	44	350,495	47	373,205	3	22,710
Chemist	9	72,215	12	94,925	3	22,710
Contract administrator	3	24,215	6	46,925	3	22,710
Physicist	5	39,355	8	62,065	3	22,710
Program analyst	3	23,785	8	61,635	5	37,850
Scientific analyst	4	31,010	5	38,580	1	7,570
GS–11. Range $6,390 to $7,465:						
Auditor	52	350,555	57	382,505	5	31,950
Contract analyst	4	26,420	7	45,590	3	19,170
Scientific analyst	10	66,480	14	92,040	4	25,560
GS–9. Range $5,440 to $6,250:						
Librarian	3	18,075	7	39,835	4	21,760
Reports analyst	3	17,805	7	39,565	4	21,760
Security technician	34	201,700	37	218,020	3	16,320
GS–5. Range $3,670 to $4,480	920	3,870,895	940	3,944,295	20	73,400
GS–4. Range $3,415 to $3,925	669	2,481,515	681	2,522,495	12	40,980
GS–3. Range $3,175 to $3,685	299	1,011,855	309	1,043,605	10	31,750
All other positions	3,230	22,031,323	3,230	22,031,323		
Total permanent, field	5,484	32,388,963	5,622	33,296,283	138	907,320
Deduct:						
Lapses	154.1	953,961	223.1	1,412,661	69	458,700
Excess civilian pay over military	38	326,465	38	326,465		
Net permanent, field (average number, net salary):						
United States and possessions	5,274.9	30,972,072	5,343.9	31,420,692	69	448,620
Foreign countries: United States rates	17	136,465	17	136,465		
Positions other than permanent:						
Temporary employment		21,422		21,422		
Part-time employment		5,100		5,100		
Intermittent employment		57,147		57,147		
Payment above basic rates:						
Overtime and holiday pay		1,600,485		1,600,485		
Nightwork differential		157,400		157,400		
Living and quarters allowance		32,700		32,700		
Other payments for personal services:						
Payments to other agencies for reimbursable details		20,000		20,000		
All personal services, field		33,022,791		33,451,411		448,620
01 Personal services, Atomic Energy Commission		43,300,000		44,150,000		850,000

SUMMARY STATEMENT

Mr. FIELDS. On page 3 you will see a summary of the estimated costs for our operating budget by our principal programs. The total estimate of operating costs for fiscal year 1957 is $1,764,869,000.

Now, to be applied to that are revenues that we estimate will accrue to us during the year, in the amount of $33,797,000, and an increase in selected resources of $49,328,000, looking toward operation in future years, resulting in total obligations of $1,780,400,000.

Now, speaking specifically to the various programs you will note the first one is the source and special nuclear materials program. The amount of our estimated costs for this program for 1957 is $1,012,582,000. That represents approximately 57 percent of our total estimated program costs. In this program is covered the procurement of our raw materials and the production processes that take those raw materials through our feed materials plants, and prepare them for

the Hanford and Savannah River plants, through the plutonium plants. In addition, this material goes to Oak Ridge for the gaseous diffusion plant, or to Portsmouth or to Paducah, for the actual separation of the isotopes that are necessary in our weapons program. So the first phase of our program is raw materials and the processing of that raw materia to make fissionable materials. That is the largest of our programs.

That material then goes to the weapons program which is the next program listed in the amount of $299,370,000.

Mr. CANNON. You say that is the largest part of your program. You mean it is also the most expensive part of the program.

Mr. FIELDS. It is the most expensive part of the program; yes, sir.

On each of these programs, I would propose, to deal more specifically with them and the elements of them as we go through the budget. I was trying to give the relationship between the programs.

Mr. CANNON. We will take them in their rotation.

Mr. FIELDS. Now, after the production of the fissionable material, it flows into our fabrication plants, where it is fabricated into weapons and a part of the cost listed under the weapons program here in a total amount of $299,370,000, is for the fabrication of that material into weapons. The remaining part of the weapons program is for the research and development activities of our weapons laboratory, the development of the new designs of weapons, and the conduct of our overseas and continental tests. So the first three programs are primarily concerned with the production of materials and the production and development of weapons, and it is those three programs that represent the 76 percent figure the Chairman referred to.

Mr. CANNON. What about the remaining percentage? Eventually he increased that to 86 percent.

Mr. FIELDS. The remaining 10 percent comes from the reactor development program, in which we have the cost developing naval reactors, aircraft propulsion units, and the development of Army package powerplants. That remaider is in the reactor development program.

Mr. CANNON. The remainder of your program comprises the remaining 14 percent?

Mr. FIELDS. Yes, sir, the entire remainder of the program.

SOURCE AND SPECIAL NUCLEAR MATERIALS PROGRAM

I would now suggest we take up the source and special nuclear materials program, and there could be inserted into the record at this time, pages 9 and 10 of the justification.

Mr. CANNON. That may be done.

(The information is as follows:)

SOURCE AND SPECIAL NUCLEAR MATERIALS PROGRAM—OPERATING COSTS

Program statement

Estimate fiscal year 1957	$1,012,582,000
Estimate fiscal year 1956	846,524,000
Increase	166,058,000

Summary of estimates by category

Category	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
1. Procurement and production	$589,401,700	$809,830,000	$977,272,000
2. Process development	37,494,517	36,694,000	35,310,000
Total source and special nuclear materials program	626,896,217	846,524,000	1,012,582,000

JUSTIFICATION OF CATEGORIES

1. Procurement and production, $977,272,000

These funds provide for (1) the procurement of uranium ore and ore concentrates from foreign and domestic sources; (2) the procurement of certain other strategic materials which are required in connection with the atomic-energy program; and (3) the operation of Government facilities for the production of special nuclear materials to meet the requirements for use in weapons manufacture, research, and development, and in the industrial programs for the peacetime applications of atomic energy. The major units of this production complex are located at Oak Ridge, Tenn.; Paducah, Ky.; Portsmouth, Ohio; Hanford, Wash.; Savannah River, S. C.; Fernald, Ohio; and St. Louis, Mo.

The increase in this category can be attributed to the overall general increase in AEC production activities, involving (1) increased procurement of uranium ores and other materials, (2) operation of existing facilities at higher rates of production, and (3) the commencement of operation of new facilities.

2. Process development, $35,310,000

These funds provide for (1) the development and improvement of methods for extracting uranium from existing and new sources of ore, and (2) improvement of processes and equipment used in producing uranium feed materials, enriched U–235, plutonium, and other special products. This development program is the means by which productive capacities, without new capital facilities, can be increased and economies and reductions in unit cost of products can be achieved. Continued development effort in the future, as in the past, is expected to yield returns many times the program costs.

(Additional information of a classified nature is presented on the following classified pages 11 through 40.)

PROCUREMENT OF URANIUM AND OTHER STRATEGIC MATERIALS

Mr. CANNON. Please let us have the benefit of any information you may have on that subject.

Mr. FIELDS. As I outlined a moment ago, this program covers the procurement of uranium ore, ore concentrates from foreign and domestic sources, and it is for the procurement of certain other strategic materials used in our process, for the operation of our large manufacturing plants at Paducah, Ky., Oak Ridge, Tenn., Hanford, Wash., and Savannah, S. C.

Mr. CANNON. Off the record.

(Discussion of the record.)

Mr. CANNON. You may proceed.

Mr. FIELDS. I would recommend that we turn to page 11, sir. In the program you just inserted, which was the source and special nuclear materials program, we now take in the classified section of the budget and break it into two programs, the first being the procurement of raw materials, which is listed here on page 11, for the procurement of strategic and raw materials. So looking specifically at the raw materials program now, we estimate our cost in this program will be $407,763,000 for fiscal year 1957.

Mr. CANNON. How does that compare with fiscal year 1956?

Mr. FIELDS. In 1956 our estimate was $285,135,000. This estimate is an increase of $122,628,000, sir.

Mr. CANNON. How do you account for the increase?

Mr. FIELDS. The increase is almost exclusively due to the fact that in fiscal year 1956 we estimate procurement, at — — of uranium oxide while for fiscal year 1957 we are estimating that — — of uranium oxide will be procured.

Mr. CANNON. Then the increase in the amount of the budget estimate, the increase in your request for additional funds is to some extent for the purchase of additional materials?

Mr. FIELDS. That is correct, sir. You asked me about the sources.

Mr. CANNON. What percentage is secured at home and what percentage abroad?

Mr. FIELDS. The United States concentrates will be — percent of that total. The remainder will be from foreign sources, Canada, the Belgian Congo, South Africa, and some from Australia.

Mr. CANNON. All of those sources are still open to you and ample material is still available?

Mr. FIELDS. Yes, sir, and is under contract, sir.

(Discussion off the record.)

RELATIVE COSTS OF RAW MATERIALS

Mr. CANNON. You have given the percentage of domestic and foreign production. What is the relative cost of this material in the United States, in continental America, and abroad?

Mr. FIELDS. If you will look on page 15, or I can read them to you.

Mr. CANNON. Will you read them for the record? Or is that classified?

Mr. FIELDS. Unfortunately, sir, this is classified information.

Mr. CANNON. You may take it off the record when you correct your remarks.

Mr. FIELDS. Yes, sir. The unit cost per pound—this is the annual unit cost per pound—from the United States is —.

Mr. CANNON. The price has stabilized?

Mr. FIELDS. Yes, sir; in 1956 — was the average price. This is relatively stabilized, I would say. It should be coming down in the future.

Mr. CANNON. A drop due to increased facilities in production?

Mr. FIELDS. Yes, sir.

Mr. CANNON. Now, in Canada the cost is — a pound, the average cost for fiscal year 1957. To what extent has that been stabilized? How far ahead can you depend on securing supplies at that price?

Mr. FIELDS. I would like to have Mr. Johnson comment on this. Mr. Johnson is the Director of our Division of Raw Materials.

Mr. JOHNSON. We have firm contracts with Canada covering the production of raw materials, not only the production that is indicated in the estimate for 1957, but there will be increasing production during the next 2 or 3 years. We have an option to extend those contracts beyond that period.

Mr. CANNON. Is production in Canada through private or through Government sources?

Mr. JOHNSON. At the present time largely Government because the original production facilities were Government, but with the large new discoveries made in the past several years by private industry production from Canada will be predominantly private industry, beginning about 1957.

Mr. CANNON. In regard to the purchase of material abroad, especially in Canada, do you have the sympathetic cooperation of both the Canadian and the British Governments?

Mr. JOHNSON. In Canada we deal directly with Canada. We have had the closest cooperation.

Mr. CANNON. Cooperation is sympathetic?

Mr. JOHNSON. Very much so, and the Canadian program was developed to a very large extent, in fact almost entirely at the request or in consultation with the United States. Canada developed its production in order to supply the military program of the United States, and we have had first call on all Canadian production.

Mr. CANNON. On the whole we have every prospect of securing the necessary material for the immediate future at least?

Mr. FIELDS. We believe that to be true; yes, sir.

Mr. CANNON. You may proceed.

PROGRAM OF EXPLORATION

Mr. JOHNSON. The procurement of source materials is in the amount of — and is the bulk of the estimated cost here. Apart from the estimated cost for the procurement that we have been talking about, we are estimating costs for a program of exploration of $10,775,000.

Now, this is to insure an adequate and continuing ore supply, and it is to aid in the production planning and assist in the appraisal of domestic uranium sources as well as to collect geological data needed in conjunction with surveys and particularly in newly discovered and undeveloped uranium bearing areas. This compares with our cost for 1956 of $11,453,000 for the same exploration program in support of the development of the source of ore in the United States.

ESTABLISHED GOALS

Mr. CANNON. We might in this connection ask you, General Fields if you have an established goal, as to number of tons of uranium and concentrates needed by some fixed date?

Mr. FIELDS. Yes, sir; we do have.

Mr. CANNON. In connection with that, will you elaborate an how that figure was initially established and what factors, if any, would change it?

Mr. FIELDS. The goal has been established as a result of the development of military requirements for weapons over the next 10-year period. We have consulted very carefully and we do periodically on a regular basis with the Department of Defense, with review by the Joint Chiefs of Staff, regarding what their goal in weapons production is.

As a result of that, we estimate our requirements for raw materials for the operation of our plants.

Mr. CANNON. I take for granted that in the setting up of the requirements for the operation of the plants you are asking more than is required for immediate consumption with a view to stockpiling.

(Discussion off the record.)

Mr. CANNON. Do you think that is a wise policy?

(Discussion off the record.)

Mr. FIELDS. In setting our last goals we dealt with the question in this manner, sir. We determined an economical optimum amount of feed that we required each year in order for the plants to get maximum production, the maximum production having been indicated as required here for a period of about 10 years. Now, on the basis of that we set our sights on contractual arrangements so that we could get this ore and you have to make long-term contracts to interest mills to come into operation and mines to be opened up.

(Discussion off the record.)

Mr. FIELDS. I believe most of the concepts of the present day are that with the atomic and hydrogen weapons you want to use in the war, they should be available early, because it could be a short war.

Mr. CANNON. Mr. Manager, it is my considered opinion that we will fight the next war with such weapons as we have available at the time the war starts. In the First and Second World Wars, we started from behind. We had allies who held the enemy in check while we started production.

Mr. FIELDS. Yes, sir.

Mr. CANNON. And we won the war, to some extent at least through production. Now, the situation has changed. There will be no opportunity for production when the next war starts, as a matter of fact the decisive period of the war will probably not last longer than a few days. So we must fight the next war with such weapons as we have at the time the war opens.

(Discussion off the record.)

Mr. CANNON. You may proceed.

BUILDUP OF URANIAM INDUSTRY

Mr. FIELDS. Now, in that connection, sir, the raw materials picture has been changing because of the strenuous efforts of the Commission, with the blessing of the Congress in the years past, to build up a uranium industry. It has resulted in building up a considerable industry. Coming out of this we anticipate a build-up in the procurement of uranium concentrates. So we are beginning to see the effect of building up this uranium industry markedly and the realization that you had to build these weapons and have them in being led to this, and led to the expansion program that the Congress authorized in 1952.

Mr. JENSEN. Will you yield for a question?

Mr. CANNON. The gentleman from Iowa.

Mr. JENSEN. Does your uranium concentrate deteriorate in storage?

Mr. FIELDS. No, sir, it does not.

Mr. JENSEN. No deterioration whatsoever?

Mr. FIELDS. No, sir, not so far as using the raw material in our plants.

Mr. CANNON. Mr. Riley.

(Discussion off the record.)

Mr. CANNON. Has Russia up to this time been able to intercept or disrupt our flow of raw materials from abroad?

Mr. FIELDS. No, sir, not to my knowledge. They have not made any attempt. If you include it that an attempt to go into the market in these countries, I think the answer is still "No."

Mr. JOHNSON. That is correct.

Mr. CANNON. And no competitive bids?

Mr. JOHNSON. There is no competitive buying. I think the reason is obvious, because we are dealing with countries that are definitely allied to our western operations.

Mr. CANNON. What can you say about Russia's supplies? Where is Russia securing her raw material, and to what extent is it a dependable source?

Mr. FIELDS. I do not know the answer to those questions, sir.

(Discussion off the record.)

AVAILABILITY OF FISSIONABLE MATERIAL FOR CIVILIAN PRODUCTION OR CIVILIAN EXPERIMENTATION

Mr. CANNON. When will there be fissionable material available for civilian production or civilian experimentation?

Mr. FIELDS. You will recall that a few months ago the President announced that there would be an allocation of 20,000 kilograms of fissionable material which would be made available for lease to commercial enterprises in this country. This would be available over a period of time, indefinite at the moment for research projects which were licensed to operate in accordance with the Atomic Energy Act. We would take portions of that allocation and lease the material to a company like the Yankee Electric Co., or some of these others that we have been referring to.

We do the same with research quantities to universities.

Mr. CANNON. Would this lead to a reduction of that amount from raw material which otherwise would be processed by the Government?

Mr. FIELDS. That would still be processed by the Government, sir, because there are as yet no commercial plants available for such processing.

Mr. CANNON. This would result in a reduction in the amount of material available for the manufacture of weapons.

Mr. FIELDS. That is correct. I should make this note on the 20,000 kilograms for the civilian use here. When we issue a license for one of these large power reactors, the initial amount of material that they need is by no means all that is required for that project. The initial loading that goes into a reactor may only represent a fifth of the material that will be burned up during the course of 10 or 15 years so that when we issue that license, we have to earmark enough of that 20,000 kilograms so that we can support that supply of material—lease it to them over the period of this project. This means that this 20,000 kilograms will not all get allotted this year or even next year. It will probably be a small fraction of it. It may be a fifth or even less than that would be required to go into those plants when they are built say, in 1958 or 1959. So it is in the future that the actual total amount will be needed in any particular year. Because of that, it represents a very small percentage of our total production for any particular year. It does not eat into the available material for the weapons stockpile markedly. This was worked out again in consultation with the De-

partment of Defense, so that they would know of the impact on the production of weapons from these civilian programs.

Mr. CANNON. What would be the total overall production of raw material for the coming year?

(Discussion off the record.)

Mr. CANNON. Do you expect a progressive increase in the amount required and the amount received from year to year?

Mr. FIELDS. Our present arrangements and contracts will lead to continued increases over about the next 5-year period. At the moment our plans do not call for an increase beyond that. Now, if there should be considerations to building up a stockpile, then one might attempt this. I mean a sizable stockpile as opposed to the one I mentioned before.

QUALITY AND PERFORMANCE LIMITATIONS IN REACTOR CONSTRUCTION MATERIALS

Mr. CANNON. Some comments have been made both in the committee and in magazines and periodicals of the country to the effect that the greatest technical limitation in our efforts to achieve economical atomic power—that is, power to compete with conventional sources—is the quality and performance limits in reactor construction materials.

Now, to what extent is this a problem, in your work?

Mr. FIELDS. It is one of the major problems in developing economic power. This is the fabrication of the fuel into a configuration that will make a reactor work. You have to put it into rods, it has to be clad with certain kinds of metals in some of the present types of reactors. This is a costly process. When you reprocess it, you have to take it down and it is a costly chemical process to recover the uranium which is not burned, because you do not burn all the uranium up, and, of course, in the development effort you are attempting to get it so that you burn up the maximum amount that is in there to reduce your processing of it. But it is the fuel fabrication, to put it in the right disposition to work in the reactor, which is one of the costly aspects.

In this connection we are working on concepts which we hope will reduce this cost markedly, and you may get away from what we call a fuel rod concept to a homogeneous reactor where your fuel is just a fluid.

Mr. CANNON. Don't you expect to find some shortcuts?

Mr. FIELDS. Yes.

Mr. CANNON. Is there a prospect of success in that respect?

Mr. FIELDS. Yes, sir; we certainly are hopeful. The fuel rod type of reactor, if you develop one that is quite successful in other aspects, could be done in mass production and this may help reduce the cost.

Mr. CANNON. In your domestic requisitions you are securing the material at home, you are dealing necessarily with the men at the mouth of the mine?

Mr. FIELDS. We are at times, and we are dealing with operating mills at other times. We deal with both. We have an ore buying program in which we buy on a price schedule any ore delivered to our ore buying stations, and then we have contracts with mills for the processing of ore for the production of concentrates. So we deal with both groups.

Mr. CANNON. Is there any propect that some of these miners will establish and operate their own processing plants?

Mr. FIELDS. The majority of the operating raw materials mills are privately owned at the present time. As a matter of fact, we only operate one. Is that not correct, Mr. Johnson?

Mr. JOHNSON. That is correct.

GUARANTEED ORE PROCUREMENT

Mr. CANNON. Most of the material you buy from the plant after it is processed?

Mr. JOHNSON. That is correct, sir. On the other hand, the Commission in setting up its program in 1948, when we had practically no production established a price for ore and has guaranteed that over a period of time. All of our milling contractors must pay the miner a price not less favorable than the price established by the Commission which protects all of the mine operators. Most of the mining operations at the start were very small. Today, even, there are approximately 1,000 mining operations in the West, some of them being only the size of two men. Others are large steamshovel operations.

Mr. CANNON. Is it possible that others of whom you speak would have difficulty in disposing of their ore at a fair price due to the fact they were not in a position to process it themselves?

Mr. JOHNSON. No, sir, the mills are required under the Commission's contract to pay the miners a price not less favorable than the price that the Commission pays the miner, which is a published ore buying schedule. Also, if ore production develops in an isolated area, and there are no mills nearby, the Commission, when there appears to be enough production to consider the construction of a mill, may establish ore buying stations so that there will be a local market for the mines in the areas.

Mr. CANNON. Then you can assure all producers regardless of the size of their operation of a stable market at a fair price.

Mr. JOHNSON. Yes; that is correct. That is as far as the ore producers are concerned. The ore producers have a fixed price.

Mr. CANNON. We have had communications here which indicated that some of the smaller producers were apprehensive in this connection. They were under the impression that the Government could at any time discontinue purchases because what they needed could be secured from the larger operators.

Mr. JOHNSON. The Commission has guaranteed the ore price to the miners through March 31, 1962.

Mr. FIELDS. Mr. Chairman, I suggest Mr. Johnson might spell out what we intend to do beyond 1962.

Mr. CANNON. The Counsel informs me that this assurance has been only given mill operators after 1962.

Mr. FIELDS. Would you explain our program as it would be extended beyond 1962?

Mr. JOHNSON. On May 24 last, the Commission announced an extension of guaranteed prices beyond March 31, 1962, through December 31, 1966.

Mr. CANNON. And it would not be a wise policy on the part of the Government to discriminate against the small producer after 1962 or any other time?

Mr. JOHNSON. In the period after 1962, the Commission has discontinued the ore-buying program and has established a price for mill product in order to put the industry on a commercial basis, so that commercial users could buy at the same time there was a Government market. The McKinney panel that was mentioned this morning, for one, recommended a program of that kind. At the present time under the present type of program, it would be difficult for a private market to develop at the same time there was a Government market. In extending the program through 1966, the Commission has endeavored to protect the small miner in this way—in all contracts with mills that have been built in connection with negotiated contracts, and that would include all the mills, the Commission will require that each mill reserve a portion of its capacity for the treatment of custom ores or ores produced by miners that are not owned by the mill.

Furthermore, there is every reason to believe that by 1962, most of the mills that are now operating will be competing with each other for ore. I would estimate there will be a seller's market as far as the ore buyers are concerned. In other words, the mills will be out competing for ore.

Mr. CANNON. By extending the time until 1966 the Government then is affording every opportunity for adjustment to changed conditions, but there is something rather ominous in what you say. You say by 1962 they may be competing for ore. Is there any chance that the supply of ore will decrease as time goes by?

Mr. JOHNSON. That was the primary reason for the Commission taking action at this time so as to provide a long-ronge market for uranium, because the known ore supplies that we have today may be very largely exhausted by 1962 with the present production programs. However, if exploration and prospecting continues active, there should be new discoveries that will support production long into the future.

When we started out with this program, there was no production of uranium in the United States in 1947. We had only a small uranium production in 1948 and 1949. As you know, production increased rapidly in succeeding years. Now, the largest increase has been the result of new discoveries. I am confident that new discoveries will continue to be made at a rate that will provide a large production of uranium in the United States, provided that there is a long enough period of a guaranteed market. When we get to 1966, we may be over to a commercial market, an industrial market where the power consumers and the power users will be taking a substantial quantity, but I think with the time lead that is now granted through 1966, there will be continued very active exploration and development. The new discoveries of the last 3 years have been very large, and those discoveries are continuing.

Mr. FIELDS. Mr. Chairman, I think we have covered the major points on the procurement of raw materials. I would only like to indicate that this figure does include the uranium concentrates, the uranium ores under the guaranteed published price schedule and the purchase of thorium, which is also a raw material that we use.

(Discussion off the record.)

Mr. FIELDS. Those are the principal elements of the procurement program.

PROCESS DEVELOPMENT

I mentioned also the exploration program. We have, in addition, an estimated cost for process development, in the amount of $3,650,000. This is looking toward improved methods for the processing of uranium ores, new types of ores, and includes development work on the extraction of uranium from shales.

NUMBER OF PERSONNEL

Mr. CANNON. Do improved processes involve reduction in personnel? For example, in August 1955, the Raw Materials Division had 104 employees. It was agreed that the Division could stand a reduction in personnel. Has that reduction been made? What is the number of employees you have at this time in that division?

Mr. FIELDS. I believe some reduction has been made. Mr. Johnson, do you have the figures?

Mr. JOHNSON. I do not recall the 104. In the Washington office, in our administrative program, I believe it was 74 at the end of last year.

Mr. CANNON. In August 1955 they had 104, and the GAO made a recommendation that you reduce personnel by 22. They thought 82 employees would be sufficient. Has that reduction been achieved?

Mr. JOHNSON. Yes, sir, I believe we have fully met the GAO recommendation. I don't have the figures but we have reduced our Washington administrative group down to 67 now, which is a reduction from 74 a year ago. Now, the higher numbers in the past—

Mr. CANNON. You mean 69?

Mr. JOHNSON. Yes, 69 is our budgeted figure at the end of 1956. Now, the higher numbers in the past were due to the fact that we were developing new programs, making new contracts throughout the world, and we were also operating to a very large extent our western operations through Washington. We now have a major operations office in Grand Junction, Colo.

Mr. CANNON. Our information is that this 69 to which you referred will have to be increased to 71 in the fiscal year 1957. Why the increase instead of a reduction?

Mr. JOHNSON. My figure now is that our force in fiscal 1957 for the Washington staff will be between 67 and 69.

Mr. CANNON. That is staisfactory.

Mr. JOHNSON. One of the big workloads we have is dealing with the large number of people interested in our raw materials program in the United States. We have up to 45,000 inquiries a year from the vast number of people who are interested in various aspects of the uranium production program. Those come to our field offices, many come to Washington, and we deal with a great many people.

Mr. CANNON. In the Washington Star of March 11, there was an article which reported that West German scientists at the University of Warburg had perfected a new separation process which may reduce the cost of separating U-235 out of uranium to about a third. Are you familiar with that?

Mr. FIELDS. I am not familiar with that, sir.

Mr. CANNON. I have here an excerpt which reads:

The new technique is supposed to be based on forcing uranium hexafluoride gas at ultrasonic speeds through a flat nozzle, the light fractions tending to accumulate near the fringe of the stream.

Mr. FIELDS. I have not heard of that particular statement.

(Discussion off the record.)

URANIUM FROM LIGNITES

Mr. CANNON. Are you working on the problem of securing uranium from the lignites?

Mr. FIELDS. There is a possibility there. There is uranium in lignites. Could you outline your work in this area, Mr. Johnson?

Mr. JOHNSON. Yes, sir. In the fall of 1954, discovery was made of uranium-bearing lignites in the North and South Dakotas particularly. We have done laboratory work on this. We have engaged the Bureau of Mines to do work, and also some private laboratories. We are now prepared to undertake some pilot work. Equipment has been added to our Grand Junction pilot plant, and in the next few months we will be running pilot-plant work on lignites.

Mr. CANNON. The lignites would constitute a cheaper or more plentiful source of supply?

Mr. JOHNSON. The prospect is that the lignites may be a more expensive source of supply.

Mr. CANNON. That would be used then only in event of failure of supplies from other sources.

Mr. JOHNSON. I would say there would be a market for lignites if it could be competitive with the cost of uranium now being obtained from conventional ores. There is a possibility of being able to get the uranium from the lignites at competitive prices, although at first glance it would appear to be possibly a more expensive source. The grade is about the same as the average grade of conventional ores, but we do have to deal with carbonaceous material. The lignites cannot be processed in a standard mill. It will be necessary to develop a separate process to treat the lignites.

DISMANTLING OF HARSHAW CHEMICAL CO.'S PLANT AT OAK RIDGE

Mr. CANNON. Tell us something about the dismantling of the Harshaw Chemical Co.'s plant at Oak Ridge. The AEC machinery was dismantled and equipment stored, you are today under a contract with that company to keep it in standby condition.

Mr. FIELDS. We do have equipment stored with the Harshaw Chemical Co.

Mr. CANNON. Why was the plant dismantled?

Mr. FIELDS. Could I ask Mr. Bloch, who is Director of the Division of Production, to answer the question?

Mr. BLOCH. This is a refinery, for purifying uranium concentrate, that was built during the war. It was placed in standby after the war because it essentially was a high-cost producer, and also because it could not handle a wide range of uranium concentrates.

Mr. CANNON. When placed in standby condition it was turned back to the Harshaw Chemical Co.?

Mr. BLOCH. Sir, the plant was built during the war by the Harshaw Chemical Co.—it is their plant—and they operated it to produce material for the atomic energy program. The equipment is owned by the Government. It was shut down after the war. However, we had to reactivate it about 2½ or 3 years ago in order to process some material due to the troubles we had at one of our chemical processing plants.

Following that job, it was again shut down and placed in standby.

Mr. CANNON. In that connection you entered into a contract with the Harshaw Chemical Co. to compensate them for keeping the plant in standby condition. You agreed to take care of any profits they might have made in the process of operation?

Mr. BLOCH. Not to my knowledge, sir. We are paying them a rental of $15,000 a month, which covers the cost of their building.

Mr. CANNON. The plant is not in operation? How long since it discontinued operation?

Mr. BLOCH. About 2½ years ago.

Mr. CANNON. Our information on that is that the Oak Ridge office decided they had no need for it and could dispense with it altogether, but they were overruled by the Production Division. What occasioned the difference of opinion between Oak Ridge and the Production Division?

Mr. BLOCH. As was discussed earlier, we currently are expanding our feed-material plants. After discussing the problem with the General Manager, it was concluded that this plant should be maintained in standby, so as to keep it available until such time as we were far enough along on the expansion of our other refineries, which are currently going on, to assure that we had ample capacity. In other words, it was insurance against an accident, which might shut down our existing refineries, until we had Weldon Springs essentially completed, and had enough refining capacity to assure that the program would not be impaired if we had an accident in any one plant.

Mr. CANNON. How much did you agree to pay?

Mr. BLOCH. It is $15,000 a month, as I recall, and this includes the rental on their building. They own the building and the land. The Government only owns the process equipment inside the building.

Mr. CANNON. We were told that the profit to the Harshaw Chemical Co. would amount to, or would average $123,000 a year. If you do not need it, we are losing $123,000 a year.

Mr. FIELDS. It is a protective measure for the period of time Mr. Bloch was indicating here, to assure our requirement for the processing of feed material.

Weldon Springs is a feed material processing plant. Raw materials will go into Weldon Springs for processing. We call it a feed materials plant. It takes the uranium concentrates and gets it into a form to go to the Oak Ridge manufacturing plant or to the reactors at Hanford or Savannah River. This plant is a similar type of plant. It will handle feed materials.

Mr. CANNON. That is the work the Harshaw Chemical Co. is doing. Is it identical with that at the Weldon Springs plant?

Mr. FIELDS. They are not doing work now, sir. This is a standby plant.

Mr. CANNON. Why are we paying $123,000?

Mr. FIELDS. Because it is on their property. It is rent. That is what it is. It is on their property. We want to preserve it so that it could be activated again if some trouble developed in our feed materials processing chain.

Mr. CANNON. If trouble develops, you don't think the Weldon Springs plant twill be able to supply our needs?

Mr. FIELDS. Not in this particular processing building. I am visualizing that something might go wrong at Weldon Springs when it is operating. We have another feed materials plant at Fernald, Ohio. We are trying to build up additional capacity. We want to reserve this Harshaw plant, so that we could operate it again, if necessary, until we get sufficient capacity when we won't need the Harshaw plant.

Mr. CANNON. When did the Weldon Springs plant go into operation?

Mr. FIELDS. It is not in operation. It is under construction.

Mr. CANNON. When will it be completed?

Mr. BLOCH. Next spring.

Mr. CANNON. Then you do not now have production either at the Harshaw plant or at the Weldon Springs plant. What is your source of supply if neither of those plants is in operation?

Mr. BLOCH. Our present sources of supply are at the Fernald plant, which is located near Cincinnati, and the St. Louis plant, which is located in downtown St. Louis.

Mr. CANNON. The downtown St. Louis plant is within a few miles of Weldon Springs. Will that plant be discontinued when Weldon Springs goes into operation?

Mr. BLOCH. No, sir.

Mr. CANNON. Both plants will be operated?

Mr. BLOCH. When Weldon Springs is in operation all three of these plants will be operating, because we need the additional capacity. At such time as Weldon Springs goes into operation we had planned on closing out the Harshaw standby, and removing the equipment and terminating the agreement.

Mr. CANNON. At that time the production division will accept the recommendation of Oak Ridge and discard the Harshaw plant?

Mr. BLOCH. That is correct. That is our plan.

IRRADIATION OF GEMS

Mr. CANNON. You are working on the irradiation of gems?

Mr. FIELDS. I am not sure that we are working on the irradiation of gems, sir. We have irradiated some. We offer irradiation services to different institutions, commercial firms, and I believe that there have been some gems irradiated as a service to industry at Brookhaven, but we are not running any process of that sort ourselves. As I understand it, you can increase the hardness by irradiation, and this is some experiment by a company in this regard to see what it will do to improve the hardness.

Mr. CANNON. Is there any other purpose in this process other than to make the gems more salable?

Mr. FIELDS. As I say, we have offered services in some of these reactors for irradiating materials.

Mr. CANNON. Is that a gratuitous service to industry?

Mr. FIELDS. No, sir, we recover full cost.

Mr. CANNON. What do you get?

Mr. FIELDS. We get paid for the full cost of services on this material.

Mr. CANNON. There is no advantage except to make the gems more salable, and there is no advantage except the revenue?

Mr. FIELDS. We generally offer this kind of service, and the main purpose of it is to facilitate the use of irradiation studies, research generally, in agriculture, medicine. This is part of that general service we have offered.

Mr. CANNON. At least it does not in any way deter or limit our work?

Mr. FIELDS. No, sir.

Mr. PHILLIPS. I understood him to say we got paid for it. Is that correct?

Mr. FIELDS. Yes, sir.

Mr. CANNON. Is there any advantage other than income?

Mr. FIELDS. The advantage is to foster the development and use of either radioisotopes or services of this kind in research and development in general. As I say, it might be in agriculture and in medicine. It just happens that a company comes along, and wants to expose some gems in the reactor to see what happens in this process.

Mr. CANNON. It does not interfere with our program?

Mr. FIELDS. No; it does not. It is part of our program in this country to foster research.

Mr. CANNON. That is being continued?

Mr. FIELDS. Yes, sir; I am not sure whether the specific program for the irradiation of gems is finished or not, but the program generally is being continued.

You recognize, Mr. Chairman, that there are many of these special facilities which only the Commission has in this country at the present time, these reactors and some of these large accelerators.

Mr. CANNON. How do you arrive at the charges which are made for this service?

Mr. FIELDS. Could I ask the controller, Mr. Burrows, to comment on that?

Mr. BURROWS. Yes, sir: these are research reactors where those services are performed. We keep full cost records of the cost of the operation. The full costs of running the reactor are divided by the amount of exposure time, and that division is allocated to the user. He pays that cost plus an overall 15 percent. The cost I might say includes the factor for the depreciation of the reactor itself.

PROCUREMENT GOAL FOR URANIUM CONCENTRATES

Mr. CANNON. You tell us that you have a definite and established goal in the number of tons of uranium in concentrates you feel you should have at a fixed date, and at the present time the number of tons is being increased.

Mr. FIELDS. Yes, sir.

Mr. CANNON. Could you tell us how this goal was initially established and what factors would change it? What effect, if any, will commitments for procurement have on it?

Mr. FIELDS. This particular tonnage for 1957 is not a goal but an estimate of receipts. We did set a goal of what we would like to get as a level of procurement per year for the optimum operation of our plants. Now, this goal as I referred to before is a higher goal. It is somewhere around ——— tons a year for the maximum production from these plants. I believe this goal was set some time ago on the basis of military requirements and the capabilities of our plants. Our efforts since the time of setting that goal have been to get to it as quickly as we could and in this particular year, 1957, we have been able to reach this mark. That is the way this number has come out for fiscal year 1957.

Mr. CANNON. At the time you made your estimates and submitted them to the Bureau of the Budget. At that time you decided that the situation was such as to make it possible for you to utilize that additional amount.

Mr. FIELDS. And to procure that additional amount.

Mr. CANNON. Is there anything that would change that understanding, that policy?

Mr. FIELDS. At the moment I think the only thing that would change it is if some of these contracts did not produce, if they were not able to produce that much or conversely, if they were to produce more we would probably attempt to take it if we had the funds to do so.

Mr. CANNON. But your position is such as to permit you to adjust your plan in either direction?

Mr. FIELDS. Yes, sir: within limits upward. There is a limit as to the total tonnage of ore that we could use economically in processing through the plant. We are away below that limit at the present time. But any decrease in the amount of uranium that we secure for processing through the plants will lead to lesser production.

Mr. CANNON. Before we take up the weapons program, Mr. Riley, have you any further questions?

Mr. RILEY. I have no questions.

Mr. BOLAND. I have no questions, Mr. Chairman.

Mr. CANNON. Mr. Phillips?

Mr. PHILLIPS. Mr. Chairman, I think we have finished the general questions.

WEAPONS PROGRAM

Mr. CANNON. Taking up the weapons program, we will insert at this point page 41 of the justification.

(The information is as follows:)

WEAPONS PROGRAM—OPERATING COSTS

Program statement

Estimate fiscal year 1957	$299,370,000
Estimate fiscal year 1956	262,739,000
Increase	36,631,000

The requested amount for fiscal year 1957 for the weapons program reflects the estimate of funds needed for the development, production and testing of atomic weapons required to meet military needs.

Research in a variety of subjects has continued to yield new developments applicable to weapons; these will be incorporated in the design of new and improved weapon models which will greatly enhance the capabilities of the Armed

Forces. The developmental effort will necessitate a continuation of weapons testing activities, which are essential to advancement in this field.

GENERAL STATEMENT

Mr. CANNON. Will you give us at this time a general statement as to your weapons program?

Mr. FIELDS. Yes, sir. Included in the estimate of cast of $299,370,000 for fiscal year 1957 are our estimated costs for the fabrication of atomic weapons and hydrogen weapons and for the actual fabrication of the fissionable material in a form necessary to go into those weapons. There is also included in there the fabrication of what I would like to term "the ordnance gear" that must be associated with this. These are the ballistic envelopes, the fusing systems, items of this nature, which also must be fabricated to make a complete weapon out of that. So you have the fabrication cost of the weapon itself. That is one item of this amount.

The other part of the estimated cost covers research and development in the development of new weapons, improvements of these weapons and improvements and developments of new weapons systems.

As I mentioned before, this includes the work of the laboratories, like the Los Alamos Scientific Laboratory at Los Alamos, N. Mex., the Livermore Laboratory at the University of California, at Berkeley, Calif., and the operation of Sandia Laboratory at Albuquerque, N. Mex.

It also includes certain production plants for the production of the ordnance gear.

(Discussion off the record.)

The Los Alamos Laboratory, as you know, started in 1942, during the war, and it has been operating since that time. The Livermore Laboratory at the University of California has been operating as a weapons development laboratory since about 1952, late in 1952. It is more recent.

The efforts of this group have been responsible for what I think are the outstanding successes we have had in the development of the weapons stockpile that we have at this time.

Now, what we are forecatsing here, is an increase in the production of weapons to go into war reserve of about — percent, or an increase in the total numbers of weapons that will go into the stockpile this next year. This represents a marked increase. It also represents weapons of different types, usable both by the Army and the Air Force and the Navy.

(Discussion off the record.)

COORDINATION OF WORK WITH ARMED SERVICES

Mr. CANNON. Will you differentiate between your work and the work of the three services of the Department of Defense?

Mr. FIELDS. I will be happy to, sir.

We work very closely together. As a matter of fact, we have installations that are adjacent to each other in New Mexico, for the coordination of our combined development and to coordinate prob-

lems, because they have to train crews and men to handle them and use them. So we have our installations on the same post, the Sandia Base at Albuquerque, for this purpose. The Commission develops and manufactures all atomic weapons and all hydrogen bombs. The Commission develops and produces the warheads that go with missiles or with rockets. The Department of Defense develops the missile or the rocket. So that there is a marriage program in the case of a warhead for a missile. That is the basic difference between us. There is no duplication. There is a great deal of combined effort in the actual operating and maintenance of the stockpile at the storage sites.

(Discussion off the record.)

Mr. FIELDS. Our principal operation at the storage sites is that of surveillance of the stockpile and the maintenance of it to see that it is ready, so that we work very closely together, and there is no duplication in any respect there.

Mr. CANNON. Up to this time that plan has proved satisfactory?

Mr. FIELDS. It has proved extremely satisfactory and effective in my estimation, sir.

Mr. CANNON. There have been no differences of opinion which could not be worked out between you?

Mr. FIELDS. That is correct. We have had differences of opinions, and arguments once in a while on weapons systems, but this is healthy, we think. We have had, in arriving at the basic decisions, considerable discussion. I think the problem that took the longest time to settle was the arrangement with respect to the missiles, just where the line would be drawn between what we would do and what they would do. As it turns out, what we have has been very effective.

BUILDUP OF STAFFS AT LIVERMORE, CALIF., BY SANDIA CORP. AND UNIVERSITY OF CALIFORNIA

Mr. CANNON. You announced on March 8 that the Sandia Corp. plans to build up its staff at Livermore, Calif., to something like 250 by July 1957, and from eight hundred to a thousand by July 1958. That is a decided increase. At the same time you announced that the University of California Radiation Laboratory would increase its staff at Livermore by 800 by July 1957. That also is a marked increase, I take for granted these increases are justified by the results you are getting?

Mr. FIELDS. It certainly is, sir.

Mr. PHILLIPS. Was any of that a transfer from Berkeley?

Mr. CANNON. Berkeley is not mentioned here. Where is the University of California Radiation Laboratory located?

Mr. FIELDS. The Livermore Laboratory is about 35 miles from Berkeley. Actually the Livermore Laboratory is operated by the University of California, which is at Berkeley.

Mr. CANNON. How long has it been in operation?

Mr. FIELDS. The Livermore Laboratory has been operating since about 1952 or 1953. On the other hand, there has been a contract with the University of California at what is termed "the Radiation Laboratory," which is near the campus, a contract that goes back into the war days as far as 1942, I believe.

Mr. CANNON. They deal principally with research?

Mr. FIELDS. The effort near the campus at Berkeley has been largely research in physics, in chemistry, medicine, and biology. That is largely the work done near the campus itself.

Mr. CANNON. It is a broad program.

Mr. FIELDS. Yes, sir, a very broad program. However, some of the chemistry that is done there has been very vital to the production programs. At a matter of fact, the first process, as I recall, for the separating of plutonium was developed at Berkeley. So they have a long history there.

Now, the buildup that you have indicated there for Livermore, both for the University of California at Livermore and for Sandia, is necessary because we started this weapons laboratory at Livermore about 3 years ago. It has taken them about 3 years to get to where they are really an operating and producing laboratory, because it is a difficult task to develop the exceptional men, to attract them there to work in these fields. With the type of talent it requires, it takes a long time to develop a laboratory. Their efforts have been markedly successful.

(Discussion off the record.)

Mr. FIELDS. You see, the real reason that Livermore was brought in was because the Commission felt that the hydrogen bomb effort needed to be expanded. That is the reason that the Livermore Laboratory was established. Now we see the results of that. In order to put these in the stockpile that laboratory has to increase, the Livermore Laboratory itself, to provide for the engineering of the nucelar portion of the weapons that go along with taking a test design and putting it in the stockpile.

The Sandia Laboratory has to be augmented in order that they can do the ordnance work associated with the nuclear work, to make fusing and the ballistic cases, and to do all the work necessary to make a complete weapon out of it. So we have reached a point where the laboratory is effective. That is the reason for the buildup of the forces there.

Mr. CANNON. Apparently the results justify the investment. This is a marked increase in both areas. What is the effect on your budget?

Mr. FIELDS. I think that increase is indicated.

(Discussion off the record.)

Mr. CANNON. What about 1958?

Mr. FIELDS. I do not have a projection for 1958.

Mr. CANNON. I am certain you would not have a projection but looking at the figures, what would you estimate?

Mr. FIELDS. I imagine it would rise a few more million dollars because of the buildup in the laboratory there. I mean the top strength in fiscal 1957 might become near the average for fiscal 1958. So the level would go up for fiscal year 1958.

Mr. CANNON. Is there any compensating reduction in your program either there or elsewhere?

Mr. FIELDS. No, sir. It is because of the need for expansion in the weapons effort.

Mr. CANNON. I am reading page 12 of the amendment to the justification.

(Discussion off the record.)

Mr. FIELDS. I was looking at a different book, sir. This is an item referring to actual procurement of materials for production purposes

as opposed to the efforts at Livermore that we have been talking about which are development efforts. The one you refer to on page 12 reflects a shift in program.

(Discussion off the record.)

Mr. FIELDS. I would like to have General Starbird, the Director of the Division of Military Applications, speak to that.

General STARBIRD. The book at which you are looking, sir, is a book to explain the supplemental request that changed the overall figures for the weapons program from $282 million to $299 million.

Mr. CANNON. It occurred to me the first time I read this that there might be another reason for the decrease mentioned. It might be that you are diverting operations in keeping with your plan of emphasizing research at the university, or it might be that your original estimate was too liberal. Would you say there was an overestimate?

General STARBIRD. No, sir. Subsequent to the time that the original budget estimates were submitted by the President, and prior to the supplemental you are now looking at, there was a change in the military requirements, as General Fields said.

(Discussion off the record.)

General STARBIRD. During that same period the decision was made to expedite this weaponization effort at Livermore. Therefore, the effort at Livermore increased. The overall change between the two was an increase.

Mr. CANNON. Are there further questions?

Mr. PHILLIPS. I am not quite sure that General Fields answered the specific question. In this increase in personnel at Livermore, does that reduce the personnel at the Berkeley end?

Mr. FIELDS. This is all new at the Livermore Laboratory.

Mr. PHILLIPS. My other question has to do with obsolescence. I will ask the question. You may wish to answer it off the record. What factor of obsolescence do we have in this weapons program? Do we have a constant obsolescence of the weapons we produce?

(Discussion off the record.)

Mr. CANNON. We turn now to the reactor development program. In view of the lateness of the hour, it might be well to defer discussion at this time. If it is agreeable to the gentleman from California, we will adjourn until 10 o'clock tomorrow morning.

FRIDAY, JUNE 15, 1956.

REACTOR DEVELOPMENT PROGRAM

Mr. CANNON. We will be in order. As we have previously stated the discussion of the reactor development program will be deferred until Monday, June 25.

JUSTIFICATION OF THE ESTIMATES

However, we will insert pages 50 to 73 of the justification at this point.

(The pages of the justification follow:)

79769—56——10

REACTOR DEVELOPMENT PROGRAM—OPERATING COSTS

Program statement

Estimate, fiscal year 1957	$285,335,000
Estimate, fiscal year 1956	172,127,000
Increase	113,208,000

The major activities included in this program are the development of civilian power reactors, the development of reactors to meet a variety of military requirements, studies to increase the store of knowledge in reactor technology and evaluate advanced reactor concepts, the operation of the National Reactor Testing Station in Idaho and certain technical facilities located there, and a program of education and training in nuclear science and engineering in universities and Commission schools and laboratories.

The Commission's program for the development of civilian power was formalized in February 1954, and has been centered around the development of five basic reactor concepts. This program has been proceeding on the basis that it is the responsibility and objective of the Commission, as an agency of the Government to develop power reactor technology to the point where one or more power reactor systems are technically and economically feasible and beyond that to develop technology for more advanced types of power reactors. It is expected that private industry and public power groups will pick up the existing technology and carry it into end products on a risk basis with the Commission's role being to push forward at the same time into more advanced technology. Each of the five basic concepts now has at least one full-scale counterpart power reactor being planned by industry or public power groups with relatively little or no Government financial assistance. In fiscal year 1956, utilizing funds appropriated for acceleration of the power reactor program, the Commission has initiated development work on two additional basic reactor concepts. In fiscal year 1957, work will be continued on the 7 concepts and work will be undertaken on 1 additional concept.

The Commission's program for military reactor development has established the great potentiality of nuclear power for military uses. The Commission is currently developing a variety of reactors for the propulsion of submarines, surface ships, and aircraft and for mobile plants to provide heat and power for remote military operations to meet requirements of the Department of Defense. During fiscal year 1957 the level of effort will be increased on existing development projects in accordance with established time schedules. In addition, development of new reactor types and adaptation of existing types to meet new DOD requirements will be initiated.

In support of the effort in developing specific reactors, general work will be continued in design and evaluation of advanced reactor concepts, fuel element development, and related fields. Increasing emphasis will be placed on a broad study of reactor control and safety involving the testing of basically different classes of reactors under adverse operating conditions to establish safe upper operating limits and to stdy the mechanisms which cause reactors to be inherently safe.

The Commission's education and training program in the nuclear engineering sciences will be expanded in fiscal year 1957. It will include training in universities and Commission schools and laboratories, and research assistance to universities.

Summary of estimates by category

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
1. Civilian power reactor development	$27,261,202	$39,394,000	$53,156,000
2. Army package power reactor program	600,785	1,700,000	3,300,000
3. Naval propulsion reactor program	27,061,956	40,018,000	72,200,000
4. Aircraft propulsion reactor program	22,557,022	51,970,000	99,000,000
5. Special classified projects	7,324,998	8,532,000	13,600,000
6. Advanced engineering and development	7,879,641	9,664,000	11,634,000
7. Separations systems development	4,490,481	4,103,000	5,364,000
8. Operational services	4,704,021	5,402,000	8,405,000
9. Training and education	771,072	937,000	5,583,000
10. Nuclear powered peace ship reactor core	0	0	3,500,000
11. Equipment not included in construction	6,504,295	10,407,000	9,593,000
Total, reactor development program	109,155,473	172,127,000	285,335,000

JUSTIFICATION OF CATEGORIES

1. Civilian power reactor development, $53,156,000

The civilian power reactor development program has as its objective the providing of a foundation of technical knowledge and experience in the design, assembly, and operation of reactors for the generation of electrical power. Since the feasibility of nuclear power and its national and international importance have already been established, the emphasis in this program is being directed toward the evaluation of and improvement in reactors for the production of economically competitive electric power.

The major achievements of this program to date are the demonstration of the technical feasibility of nuclear power and the significant advanceement toward economic feasibility. Also, this program was conceived as, and continues to be, a minimum Government supported program encouraging industrial participation, thus providing the basis for transition to a privately financed nuclear power industry.

Each of the five basic reactor concepts selected for development under the program of civilian power reactor development formalized in February 1954, now has at least one full-scale counterpart power reactor being planned by industry or public power groups.

The basic program has progressed substantially as planned with two of the basic concept experimental reactors, sodium reactor experiment and homogeneous reactor experiment No. 2, scheduled for operation in fiscal year 1957. The experimental boiling-water reactor will be in final stages of assembly; and construction of the experimental breeder reactor No. 2 will be initiated. The pressurized water reactor is being accelerated looking toward initial operation during 1957. In addition, the effort that has been afforded the design studies and laboratory demonstration on the liquid metal fuel, organic moderator, and water graphite reactor concepts has reached a state of development which justifies establishment of new projects for more vigorous attention at this time.

In line with the policy to bring private industry into the engineering development of nuclear power, the Commission invited the submission of proposals for the development, design, construction, and operation of nuclear powerplants to demonstrate the practical value of such facilities for industrial or commercial purposes. Four such proposals have been submitted in response to this invitation. These proposals have been received from Nuclear Power Group (boiling water reactor, 180,000 kilowatts), Detroit Edison Group (fast breeder, 100,000 kilowatts), Yankee Atomic Electric Co. (pressurized water reactor, 100,000 kilowatts), and Consumers Public Power District, Columbus, Nebr. (sodium graphite reactor, 75,000 kilowatts). Two of these proposals, Detroit Edison Group and Consumers Public Power District, have been accepted under this program for further negotiation toward a contract. The Nuclear Power Group was informed that inasmuch as its proposal did not require Government financial assistance it would be treated simply as a licensee application outside the scope of the Power Demonstration Reactor Program. The Yankee Atomic Electric proposal has been negotiated. The obligational authority required for AEC assistance under these proposals is to be funded from Power Reactor Acceleration funds provided in 1956.

An application for license to construct and operate a 250,000 kilowatts pressurized water reactor nuclear powerplant has been made by Consolated Edison Co. of New York. The Pennsylvania Power & Light Co. has informed the Commission that it plans to make aplication for a similar license on a 150,000 kilowatt homogeneous reactor nuclear powerplant.

Responses to the first invitation of the Power Demonstration Reactor Program demonstrate the potential effectiveness of this joint participation approach in accelerating the development of power reactors at a minimum expense to the Commission and places these projects in a framework of normal industrial participation. A second invitation of the Power Demonstration Reactor Program, limited specificaly to proposals for small-output plants was offered in fiscal year 1956.

It is considered essential to be in a position to accept selected proposals beyond the scope or time schedule of those submitted in response to the first two invitations, that may contribute significantly to the achievement of economic nuclear power. Funds in the amount of $10 million are budgeted under "unpaid obligations" to provide for assistance under such proposals and for the further advancement of civilian power technology in areas which promise to contribute most to the attainment of competitive economic nuclear power.

(*a*) *Pressurized water reactor: Fiscal year 1956, $15,200,000; fiscal year 1957, $14,800,000.*—The pressurized water reactor (PWR) project was started in fiscal year 1954 in order to permit a major advance toward realization of civilian nuclear power. This will be the first United States full-scale nuclear central station powerplant. It is being built on the Ohio River at Shippingport, Pa., 25 miles from Pittsburgh. Westinghouse Electric Corp. is the Commission's principal contractor for the design, development, and construction of the reactor portion of the plant. Duquesne Light Co., of Pittsburgh, is participating in this project and making contributions which include furnishing a site for the entire project, building the turbine-generaor portion of the plant, operating the entire plant, and assuming 85 million of the cost of construction of the reactor portion of the plant.

In fiscal year 1957 theoretical and experimental nuclear studies will be continued with the objective of proving detailed design of the inital core as well as establishing plant operating procedures and conditions. Core instrumentation and refueling equipment development and procurement activities will be nearly completed. Testing of all plant components and equipment will be completed. Construction of site facilities and structures will be completed, and delivery of all plant components and equipment to the site will be accomplished.

Core manufacturing operations will be at their peak effort this year, and it is expected that by the end of fiscal year 1957 core assembly will be complete and the initial core ready for insertion in the pressure vessel.

A substantial portion of the development work on an improved replacement core will be accomplished this fiscal year. An irradiation test loop will be required for testing and proving advanced fuel elements. Fuel material selection will be finalized and fuel element process specifications will be started. The advance ordering of materials for the replacement core will be completed and fabrication of core components started.

The major elements comprising the cost estimates are:

	Fiscal year 1956	Fiscal year 1957
Research and development on initial core and reactor system	$14,700,000	$8,000,000
Research and development on replacement core	500,000	5,000,000
Fuel fabrication (start of replacement core)	0	1,800,000
Total	15,200,000	14,800,000

(*b*) *Boiling water reactor: Fiscal year 1956, $5,114,000; fiscal year 1957, $2,565,000.*—This activity is directed toward the development of boiling water reactors in which the coolant moderator boils within the reactor core and passes directly to the steam turbine. The primary objective is the fabrication of a 20,000-kilowatt reactor (boiling water reactor experiment) for the demonstration of the boiling reactor principle.

Early in fiscal year 1955, the first experiment, Borax I, was carried out. A very large amount of reactivity was added in a very short time. The experiment was damaged beyond repair and a new one was built. The second experiment, Borax II, was operated at 300 pounds per square inch gage, and at power levels up to 8,000 kilowatts. Its steam was vented to the atmosphere. Numerous experiments were performed which firmly established the feasibility of reactor coolant boiling.

Toward the end of fiscal year 1955 a new core was installed in the experiment, making it Borax III, and a turbogenerator installation was attached in order to demonstrate the production of useful power, and to study problems of activity buildup and power fluctuation.

The design of the 20,000-kilowatt reactor experiment is essentially complete. The building construction is under way and it is expected that the plant will be placed in operation by February 1957.

Research and development under this activity during fiscal year 1957 includes design and evaluation of water moderated reactors, heat transfer studies on components and fuel elements, and reactor components evaluation including fabrication of in-pile loops.

The major elements comprising the cost estimates are:

	Fiscal year 1956	Fiscal year 1957
Research and development	$1,754,000	$1,476,000
Fuel fabrication	902,000	277,000
Test operations	0	124,000
Reactor experiment fabrication	2,458,000	688,000
Total	5,114,000	2,565,000

(c) *Homogeneous reactor: Fiscal year 1956, $8,200,000; fiscal year 1957, $8,400,000.*—The object of this activity is to develop the homogeneous reactor for use in commercial power production. The main effort is directed toward the development of a thorium power breeder system at ORNL. This system has favorable nuclear aspects and the prospect of low cost electrical power. In fiscal year 1955, dismantling of the HRE–1 and modifications of the building were completed, and the HRE–2 steel shield tank was installed. HRE–2 fabrication and installation will be completed, and the reactor placed in operation about the middle of calendar year 1956. Three series of experiments are planned. The first will use a heavy water blanket. Operational reliability and ease of maintenance will be demonstrated in early fiscal year 1957 followed by a demonstration of continuous removal of fission products from the fuel. After modification of the HRE–2 to allow operation at higher power (10–20 MW heat) and with alternate blankets, subsequent experiments will include operation with thoria slurry blanket, and uranium solution blanket, including demonstrations of blanket processing.

Fabrication, installation, and operation of the HRE–2 are backed by major research and development activities. Information from the development program will be verified in the HRE–2, and in turn, experience from the HRE–2 will influence future direction of the development program. The long range project objective is the study and development of technology required for the design and construction of a full-scale homogeneous reactor for production of power and regeneration of fissionable material. The increase in program level from fiscal year 1956 to fiscal year 1957 results primarily from increased costs of in-pile and dynamic loop fabrication and testing, and costs of modifications for operation of the HRE–2 at higher power (10–20 MW heat), slurry system, fuel reprocessing research and development, and chemical pilot plant conversion.

The reactor experiments at Los Alamos are focused on two aqueous homogeneous type reactors. These reactor concepts are being investigated for the purpose of developing a small output reactor having central powerplant potential. LAPRE–I went critical in February 1956, and it is expected that LAPRE–II will go critical early in fiscal year 1957. During fiscal year 1957 it is planned to evaluate operational behavior of both reactors to develop the potential advantages to both civilian and military power applications.

The major elements comprising the cost estimates are:

	Fiscal year 1956	Fiscal year 1957
Research and development	$6,950,000	$7,150,000
Test operations	150,000	750,000
Reactor experiment fabrication	1,100,000	500,000
Total	8,200,000	8,400,000

(d) *Fast breeder reactor: Fiscal year 1956, $4,905,000; fiscal year 1957, $6,513,000.*—The objective of this activity is to develop the fast breeder reactor for use in commercial power production.

The major effort going into this project at Argonne National Laboratory is directed toward the development, construction, and operation of a pilot-size fast reactor, EBR–II, having 62.5 MW thermal output and a neutron flux, power density, temperatures, and heat transfer rates comparable to the full-scale reactor. During fiscal year 1956, the major effort will be divided between reactor systems design and evaluation. A nonnuclear prototype one-half size EBR–II will be completed and operated to prove design data for electromagnetic pumps for sodium fuel element loading and unloading devices, remote maintenance methods and other important nonnuclear design parameters associated with the full-scale experimental reactor. It is planned to continue operation of this half-scale model into fiscal year 1957 to prove the reliability of all important

components. Fabrication of the first and second fuel element cores will begin during the third quarter of fiscal year 1957. Construction of the reactor plant will start in fiscal year 1957 at the National Reactor Testing Station. The present schedule calls for preliminary operation of the reactor late in fiscal year 1958.

Los Alamos Scientific Laboratory began design study and research and development during fiscal year 1956 and will continue to expand its effort toward developing an advanced fast reactor utilizing a low melting plutonium alloy as a molten reactor fuel.

The major elements comprising the cost estimates are:

	Fiscal year 1956	Fiscal year 1957
Research and development	$4,619,000	$5,698,000
Test operations (EBR-I)	286,000	0
Fuel fabrication (EBR-II)	0	815,000
Total	4,905,000	6,513,000

(e) *Sodium graphite reactor: Fiscal year 1956, $3,375,000; fiscal year 1957, $1,378,000.*—The sodium graphite reactor experiment was started in fiscal year 1954. The project is centered around the design, development, fabrication, and experimental operation of a 20 μw (heat) experiment. The work is being performed by North American Aviation, Inc., at its laboratory sites located in Downey and Santa Susana, Calif. The program has been in operation for somewhat over 2 years and much of the preoperational research and development on reactor components is completed and vendors' delivery schedules and costs are available on essentially all of the reactor components. Reactor startup operations are scheduled for the second quarter of fiscal year 1957.

Cost increases have been experienced both in research and development activities and fabrication of the reactor itself. A major reason for the reactor fabrication cost increase has been the increased complexity of the reactor plant systems, which has been revealed as their detailed design has progressed. Research and development costs have risen primarily due to unanticipated difficulties in the development of the sodium pump, the fabrication of zirconium and control and safety elements. During fiscal year 1957 the major effort will be devoted to completing reactor fabrication, test operations and performance evaluation.

The major elements comprising the cost estimates are:

	Fiscal year 1956	Fiscal year 1957
Research and development	$2,146,000	$1,233,000
Fuel fabrication	87,000	0
Test operations	100,000	392,000
Reactor experiment fabrication	2,167,000	0
Gross cost	4,500,000	1,625,000
Less North American Aviation's share of cost	1,125,000	247,000
Net cost	3,375,000	1,378,000

(f) *Liquid metal fuel reactor: fiscal year 1956, $2 million; fiscal year 1957; $3,500,000.*—This activity has been carried on in past years as a component development study at the Brookhaven National Laboratory under the advanced engineering and development category. These studies indicate that liquid metal fuel systems are feasible for both civilian and military use and have possibilities for achieving low cost power. On the basis of the results of these studies an expanded program is underway which will include large scale engineering development of chemical processing equipment, reactor cores, heat exchangers, and fuel circulating pumps leading to the construction of a liquid metal fuel reactor experiment after fiscal year 1957.

(g) *Organic moderator reactor: fiscal year 1956, $600,000; fiscal year 1957, $600,000.*—Preliminary investigations indicate a power reactor, utilizing a hydrocarbon for moderator and coolant, promises the following desirable features: (1) A relatively simple and inexpensive core structure resulting from use of a fluid moderator; (2) small compact core leading to low cost design; (3) coolant temperatures in the range 500° to 700° in a low-pressure reactor and primary

coolant system; (4) large negative temperature coefficient favorable for stability of operation and safety considerations; (5) good neutron economy in close-packed lattices; (6) no uranium-coolant reaction hazard; and (7) no coolant water reaction hazard. In particular the OMR may be especially attractive for relatively small stationary powerplant applications, both domestic and foreign, for special purpose "package" power units, and for naval propulsion applications.

In order to determine the feasibility of an organic moderated reactor, it is planned to proceed in fiscal year 1956 with a small scale reactor experiment to be completed early in fiscal year 1957.

(*h*) *Water graphite reactor: Fiscal year 1956, none; fiscal year 1957, $400,000.*—It is planned to initiate a work program in fiscal year 1957 centered around development of plutonium and long-lived fuel elements, and engineering development of reactor components leading to the fabrication of a water graphite reactor experiment. Because of the advanced state of water graphite reactor technology it is believed that fabrication of the reactor experiment can be started late in fiscal year 1957.

(*i*) *Power reactor acceleration: Fiscal year 1956, none; fiscal year 1957, $15 million.*—The funds requested under this activity provide for accelerating research on power reactors in Commission laboratories and installations. This will be accomplished in such activities as the flexible boiling reactor experiment to investigate operational behavior under a wide variety of conditions; the homogeneous reactor experiment using a thorium slurry system; modification and fabrication of a new and improved core for the experimental breeder reactor No. 1; a second core for the sodium reactor experiment; additional research and development on the organic moderated concept; additional component development on the liquid metal fuel reactor concept; and an acceleration of the efforts on reactor safety tests, including a fast reactor safety experiment.

These possible means of accelerating the program are cited as examples. Specific application of these funds will be dictated by developmental progress, on a priority basis, within available funds.

The Commission budget for fiscal year 1957 also provides $10 million under the activity "Increase or decrease in selected resources" to encourage private initiative in the development and construction of power reactors with limited participation by the Commission. This participation will consist of limited support of preoperational and postoperational research and development in connection with industrial participation in the power demonstration programs.

2. Army package power reactor program, $3,300,000

The objective of this program is the development of a family of reactor systems to fulfill military requirements for package powerplants to be used in remote areas, and for special purposes, such as food irradiation, in accordance with advice from the Department of Defense. To meet this objective, reactor concepts which show promise of fulfilling military requirements must be studied and evaluated, and those best suited to particular needs must be developed through the following stages: (1) Feasibility study, conceptual design, and definition of research and development effort, (2) engineering development of materials and components, (3) final design, and (4) operating prototype.

Studies and evaluations to date have resulted in selection of three general reactor concepts for development into military package power system: (1) Pressurized water heterogeneous reactors, (2) boiling heterogeneous reactors, and (3) gas-cooled reactors. Advanced concepts will be studied for eventual application to long-range military requirements.

Development efforts planned for fiscal year 1957 on gas-cooled reactor systems include initiation of those required for development of economic plants for domestic and foreign civilian applications in the 5 to 20 MW useful output power range.

All of the activities planned will add to the technology required in civilian power reactor programs as well as in the military program.

The major elements comprising the cost estimates are as follows:

	Fiscal year 1956	Fiscal year 1957
Research and development	$1,500,000	$1,720,000
Fuel fabrication	200,000	300,000
Reactor experiment fabrication (gas-cooled)	0	1,280,000
Total cost	1,700,000	3,300,000

3. Naval propulsion reactor program, $72,200,000.

This category contains development programs for specific reactors for naval propulsion plants; research effort to evaluate new concepts that may produce higher performance and special purpose powerplants for naval vessels; and the support and operation of a testing facility which will contribute to the technology of all water-cooled reactor plants. The specific reactor projects constitute a program by the Atomic Energy Commission and the Department of the Navy. This program continues to be recognized as an important accelerating influence in the practical development of all nuclear plants.

There are two projects in the initial program, the submarine thermal reactor (STR) and the submarine intermediate reactor (SIR). A prototype of the STR, the mark I, has been operating radioactively at the National Reactor Testing Station in Idaho since March 1953. The STR mark I plant now has ceased to be the prototype plant for the *Nautilus*, which has been operating at sea since January 1955, and has been redesignated the naval reactor testing facility. It will continue to operate in support of all water-cooled reactor plants, and to test cores of improved design. A prototype of the SIR, mark A, has been operating radioactively at West Milton, N. Y., since May 1955. Full power was attained on June 6, 1955. The SIR, mark B, will be installed in the *Seawolf* which was launched on July 21, 1955.

The increased fund requirements in fiscal year 1957 are the result of expansion of development work on nuclear propulsion plants for both submarines and surface vessels. Maximum effort will be exerted to develop a group of nuclear propulsion plant for naval vessels in a range of power ratings covering all feasible applications.

4. Aircraft propulsion reactor program, $99 million

The aircraft propulsion reactor program is directed toward the fabrication and testing of nuclear reactors suitable for use in an aircraft propulsion system. Research and development on other components of the propulsion system is covered by Air Force contracts.

The fiscal year 1957 estimate provides for increased emphasis on the research and development program, the fabrication and operation of major experiments, and operation of the ground test facilities at the National Reactor Testing Station.

5. Special classified project, $13, 600,000

Justification for this project is contained on classified pages 88 through 90.

6. Advanced engineering and development, $11,634,000

The objectives of this category are to develop reactor engineering concepts and evaluate engineering data in support of all reactor projects. Although the studies underway are specific, the results obtained therefrom are applicable to many reactor types. The broad reactor engineering techniques developed permit either a direct solution to a specific problem or an indirect solution by means of interpretation or extrapolation of the data. Approximately half of this work is done in national laboratories and half in universities, engineering institutions, other Government agencies, and industry. In fiscal year 1956 costs are estimated at $9,664,000.

Specific reactor projects are an outgrowth of such general development work. The major features of each current reactor project are a direct result of prior work in this field. A healthy long-range reactor development program demands that new ideas, materials, components, and processes be continually investigated, that advanced reactor designs be conceived and evaluated, and that associated facilities such as those for fuel fabrication, chemical processing, and waste treatment are feasible from the engineering standpoint.

The work in this category covers the entire field of science and engineering as implied by the foregoing needs. In addition, the economics of the reactor programs require that continued effort be expended to reduce the costs of materials and fabricated components. The work is primarily applied engineering rather than basic engineering and the program attempts to strike a proper balance between immediate problems and the long-range problems associated with advanced concepts.

Major emphasis in fiscal year 1957 will be directed toward a broad study of reactor control and safety. Basically different classes of reactors will be tested under adverse operating conditions in order to establish safe upper operating limits and to study and develop mechanisms which will make a reactor inherently safe. These mechanisms will be extremely important in future reactor design, particularly when one visualizes the location of reactors in more densely popu-

lated areas. This activity is primarily responsible for the cost increase in fiscal year 1957 over fiscal year 1956.

Work will continue in the fields of reactor concepts design and evaluation, reactor physics, fuel element development, materials and components, heat transfer, and specific areas of interest for the development of industrial power reactors.

7. *Separations systems development, $5,364,000*

Separations systems development programs are directed toward development of design criteria for chemical processing systems for the control of gaseous liquid and solid effluents, and for separations systems. In addition, sanitary engineering studies are conducted which include site selection of reactors and their associated facilities, and problems concerning chemical and metallurgical processing and waste treatment plants. Studies are also conducted on the development of processes for utilizing the fission products produced in a reactor. Fiscal year 1956 costs are estimated at $4,103,000.

During fiscal year 1957 additional studies will be undertaken to adapt existing techniques to the processing of a variety of power reactor fuel elements in order to obtain optimum integrated chemical and metallurgical process plants for power reactor plants. These additional studies account for the major increase in cost in fiscal year 1957 in this program. Included also in the fiscal year 1957 estimates for this category are studies on the economies of processing military and power reactor spent fuel elements; the feasibility of disposal of high-level wastes without environmental hazard and with reduced waste-disposal costs; and the removal of specific long-lived radioisotopes from waste-fission product mixtures.

8. *Operational services, $8,405,000*

This category includes the operation of facilities such as reactors, processing plants, test stations, and the startup and standby of special reactor materials production and fabrication plants.

(*a*) *Operation of test reactors: Fiscal year 1956, $3,100,000; fiscal year 1957, $3,900,000.*—The materials-testing reactor operates to provide high-neutron flux for research purposes for various AEC contractors, AEC-sponsored and public groups in the study of radiation damage; to assist with fundamental research on transuranic and other elements; to aid in the development of fuel elements for various types of reactors; to produce isotopes; and to provide a source of neutrons for cross-section measurement work.

The increase in cost of operating the materials-testing reactor for fiscal year 1957 represents an increase in power level of 50 percent over fiscal year 1956.

Construction of an engineering test reactor at the national reactor testing station at Idaho is underway and is expected to be completed in March 1957. The present schedule calls for fabrication of the fuel elements in fiscal year 1957 and for preoperational testing in the last quarter of the fiscal year.

The major elements comprising the cost estimates are:

	Fiscal year 1956	Fiscal year 1957
Materials-testing reactor:		
Gross cost of operation	$3,520,000	$3,750,000
Less irradiation services for other programs	420,000	450,000
Net cost	3,100,000	3,300,000
Engineering test reactor:		
Planning and engineering	0	440,000
Fuel element fabrication (initial load)	0	160,000
Total	0	600,000

(*b*) *Operation of the chemical processing plant:* Fiscal year 1956, $800,000; fiscal year 1957, $3 million.—This is a continuing activity and provides for the routine operation of the chemical processing plant at the National Reactor Testing Station in Idaho, to recover enriched uranium from irradiated fuel elements. The operating contractor is the Phillips Petroleum Co. Fuel-processing costs are budgeted under and charged to the problem generating the feed materials. In fiscal year 1956, fuels processed will be primarily for the special nuclear materials program. In fiscal year 1957, fuel processing for the special nuclear materials program will be substantially reduced, and the fuels processed will be primarily for the reactor development program. Only the costs to the reactor development program are budgeted here.

Details of the cost estimates are:

	Fiscal year 1956	Fiscal year 1957
Gross cost of operation	$3,900,000	$3,900,000
Cost distributed to special nuclear materials program	3,100,000	900,000
Net cost to reactor development program	800,000	3,000,000

(c) *Operation of the National Reactor Testing Station: Fiscal year 1956, $1,297,000; fiscal year 1957, $1,360,000.*—This is a continuing activity and provides for the net cost of operation of the central services and facilities at the National Reactor Testing Station which are required in support of the technical plants and experiments at the station. Central services include stationwide security, health physics, fire protection, communications, medical and safety services, technical library, laundry, bus and cafeteria operations, warehousing, machine shops and maintenance shops and maintenance of interarea roads, powerlines, and waterlines. The estimated total cost of operation in fiscal year 1957 is $3,195,000, of which $1,835,000 will be recovered through charges to others for services. The net costs of $1,360,000 are budgeted here. The increase in costs over fiscal year 1956 is for transportation operations and health and safety services required for additional operating personnel assigned to the site.

(d) *Standby special reactor materials, production and fabrication facilities, fiscal year 1956, $110,000; fiscal year 1957, $50,000.*—This estimate provides for maintaining the Bureau of Mines, Albany, Oreg., zirconium-production plant in standby status. Standby costs include salaries of guards and maintenance employees, maintenance supplies and utilities, and related overhead costs. The decrease in cost from fiscal year 1956 to fiscal year 1957 in this activity is based on placing the Luckey, Ohio, beryllium-production plant in operation in fiscal year 1957, which is presently on standby status.

(e) *Transportation and security shipments: Fiscal year 1956, $95,000; fiscal year 1957, $95,000.*—This estimate is for coordinating, escorting, and providing armed protection for shipments of highly classified materials and documents, as well as materials that cannot be transported by common carrier because of health and safety hazards.

9. Training and education, $5,583,000

This activity provides for a program of training and education in the nuclear engineering sciences. The program covers the operation of schools by the Commission for the purpose of providing training with the unique facilities available at Atomic Energy Commission's installations and furnishing assistance to universities in acquiring types of nuclear equipment which are required in providing training in nuclear engineering at university sites.

The expanson of the program in fiscal year 1957 is based on the need to increase the annual rate of trainees from about 400 to about 2,000 annually during the next 3 years. If the United States is to provide the basis for an expanded nuclear power program in this country and to provide assistance to foreign countries to reap the benefits of atomic energy, it will be necessary to provide for this increased output of nuclear engineers. It is anticipated that the amount requested will permit the initiation of the program in 1957 with a requirement for a higher level of costs in the next 3 years. The items making up the estimates are as follows:

(a) *Assistance to universities, $3,500,000.*—

Training equipment, $3 million: This portion of the program provides funds to be used in acquiring equipment for training of scientists and engineers and which would be made available to universities, on a loan basis, under suitable contractual arrangements. Such equipment would include that necessary for the laboratory study of physics, metallurgy, chemistry, etc., of atomic energy.

Services to universities, $400,000: Provides for the fabrication and reprocessing of fuel, moderator materials, neutron sources, etc., in Commission installations which will be made available to universities for training programs.

Research training projects, $100,000: Provides for cost of special research work as can be conducted by bachelor and master candidates in nuclear engineering. For example, measurement of critical mass of various configurations of special nuclear material, and development work on coolant, moderator and structural materials.

(*b*) *Training, $2,083,000.—*

Faculty training, $450,000: Provides for the special training of members of university faculties so that the universities can conduct adequate undergraduate and graduate training programs in nuclear engineering. This will be accomplished by three general methods:

The conduct or support of summer institutes for university faculties at AEC sites or at universities, $100,000.

Making appointments available to university faculty members at Commission laboratories for 1-year "internships," $250,000.

Loan of AEC and AEC contractor personnel as visiting professors to universities, $100,000.

Student training, $1,633,000: Student training will be provided through the Commission schools at Oak Ridge and Argonne National Laboratory, through courses at private universities, on-the-job training, and short-term training courses at Commission facilities, and through a program of fellowships in nuclear engineering. The costs for student training are itemized as follows:

Oak Ridge School of Reactor Technology, $283,000: This school provides for training of design and development engineers in the field of reactor development. Courses are of 12 months' duration. Operating costs are estimated at $350,000 for fiscal year 1956 and $283,000 for fiscal year 1957. Receipts for tuition are expected to be $45,000 in fiscal year 1956 and $132,000 in fiscal year 1957, and are reflected in the "Revenues applied" portion of the budget.

The makeup of the anticipated student enrollment for fiscal year 1956 and fiscal year 1957 is expected to be as follows:

Class of student	Course beginning September 1955	Course beginning September 1956
Recent college graduates	23	4
Employees of Government agencies and Government contractors	40	56
Industry-sponsored students paying $2,500 tuition per course	18	53
Total number of students	81	113

School of Nuclear Science and Engineering, Argonne National Laboratory, $650,000: This school, which was established in March 1955, provides for training of American and foreign scientists in nuclear science, engineering, and technology. The training lies within national security limits with academic interest being placed on basic reactor principles, design, construction, and peacetime application. All students pay tuition based on a rate of $2,500 for 12 months, which would be $1,500 for a 7-month course and $2,000 for a 10-month course. Receipts for tuition are expected to be $97,500 in fiscal year 1956 and $260,000 in fiscal year 1957, and are reflected in the "Revenues applied" portion of the budget. Plans are being made for 10-month courses beginning in fiscal year 1957, with participation by selected American universities to the extent that students will spend 5 months of the course at a university and 5 months at the Argonne School.

Costs in fiscal year 1956 and fiscal year 1957 are itemized below:

Item	Fiscal year 1956	Fiscal year 1957
Costs at Argonne	$587,500	$475,000
University subcontracts	0	175,000
Total	587,500	650,000

Following is the information on courses conducted from the establishment of the school and planned through fiscal year 1957:

Course	Start date	Duration	Number of students		
			American	Foreign	Total
1st	March 1955	7 months	9	30	39
2d	November 1955	do	21	44	65
3d	September 1956	10 months	21	44	65
4th	February 1957	do	21	44	65

Establishment of short-term training courses, $150,000: It is expected that 3 such courses for as many as 60 (university faculty) per course will be given at AEC sites or at universities at an estimated cost of $50,000 per course.

For 200 fellowships in nuclear science and engineering, $450,000: This will consist of about 100 undergraduate fellowships at $2,000 each and 100 graduate fellowships at $2,500 each.

Preparation and distribution of textbooks and reports, $100,000: This is to provide for the cost of preparation and distribution of textbooks and laboratory manuals, and the publication of theses as will be required to effectively conduct the training program.

10. Nuclear powered peace ship reactor core, $3,500,000

It is assumed that the Congress will authorize the construction of a nuclear powered peace ship in fiscal year 1956 and that the Atomic Energy Commission will be responsible for the construction of the reactor and its associated components, propulsion machinery and its installation in the ship. It is planned that construction of the reactor plant will be initiated in fiscal year 1956 with plant and equipment funds. The above estimate is for design, procurement, and installation of the reactor core in fiscal year 1957. The estimate is based on experience in the design and fabrication of submarine thermal reactor-type cores.

11. Equipment not included in construction, $9,593,000

The reactor development program requirements for replacement and additional equipment for research, development, and administrative use are provided for in this category.

Operating costs of this program are estimated to increase from $172.1 million in fiscal year 1956 to $285.3 million in fiscal year 1957. However, the cost of equipment in fiscal year 1957 is expected to decrease from the fiscal year 1956 level of $10,407,000 to $9,593,000. The larger estimate for fiscal year 1956 represents a buildup in acquiring laboratory equipment for the expanded military reactor programs in fiscal year 1957. The distribution of the estimated fiscal year 1957 costs between replacement and additional equipment is shown, by office, in the following table:

Office	Replacement	Additional
Chicago	$1,233,300	$3,596,600
Idaho	88,500	653,600
New York	108,000	485,000
Oak Ridge	550,000	740,000
San Francisco	0	725,000
Santa Fe	150,000	0
Schenectady	402,500	760,500
Washington	0	100,000
Total	2,532,300	7,060,700

Eighty-six percent of the total estimate comprises laboratory and shop equipment required principally to support the development of reactors for both civilian and military uses. The remaining 14 percent is for other categories of equipment needed throughout the reactor development program such as heavy mobile, hospital and medical motor vehicles, and security and protection equipment.

Replacement equipment requested consists primarily of replacements of laboratory equipment for contractors engaged in reactor research and development. Additional equipment, consisting chiefly of laboratory and testing equipment,

is required for the expanded reactor development program, particularly the developmnet of reactors to meet requirements of the military services.

EMBARGO ON BRAZILIAN ORES

Mr. CANNON. May I remind the members of the Commission of a statement given us yesterday to the effect that our sources of raw material were stabilized, and there was no prospect of any interference or interruption of delivery of nuclear material within the visible future.

But, I note in this morning's newspapers an article distributed by the Asscociated Press to the effect that such materials have been embargoed by Brazil, and that shipments from Brazil, have been halted pending further notice. The articles goes on to say:

The President of Brazil has halted shipments of atomic minerals to the United States until further notice. The head of the foreign commerce section of the Bank of Brazil gave no reason except to say that the shipments were held up for further study.

According to the statement, Brazil has—and this is directly in connection with the testimony given the committee by the Chairman of the Commission yesterday—Brazil has an agreement to trade $6 million worth of monazite, a mineral containing thorium, in exchange for United States wheat.

That is an interesting development in view of your statement of yesterday, and the fact that it also affects the legislation recently passed by the House for the benefit of agricultural products in which the disposition of surplus wheat by sale abroad was an important factor.

I would like to ask, in view of the positive statements made yesterday by the Chairman, if this development is unexpected. Also whether it is considered as merely temporary. Will you tell us just what is the significance of this development.

Mr. FIELDS. Mr. Chairman, with respect to the latter, we are hopeful that it is temporary.

Mr. CANNON. You were not aware of it yesterday?

Mr. FIELDS. Not until I saw it in the newspaper today. I would like to say this. The embargo has to do with the procurement of thorium, which is one of the raw materials which we are procuring only on a very limited basis. It is not the basic material, at the moment, for our operations that uranium is. We do not secure any uranium from Brazil.

Mr. CANNON. Would you say it is not essential?

Mr. FIELDS. It is essential for research and development on the possibilities of a third fissionable material; namely, uranium 233, which is another fissionable material isotope of uranium.

(Discussion off the record.)

Mr. FIELDS. The uranium 233 is made from monazite, and we have had research projects on this material underway for some time.

With respect to this particular circumstance, we do have contracts with Brazil for the delivery of monazite. I might ask Dr. Johnson if he has anything further on this particular incident which, I hope is temporary.

Mr. CANNON. Can you give us further information on this, Mr. Johnson?

Mr. JOHNSON. Mr. Chairman, the contract with Brazil was concluded quite some time ago, and that involved, as you mentioned, a

sale of wheat to Brazil, and in turn the sale of thorium to the United States.

We were advised yesterday by cable that the Brazilian Government had suspended a portion of the contract deliveries, and we understand unofficially that it is pending a survey of their operations.

Mr. CANNON. That telegram was not available at the time you were before the committee yesterday?

Mr. JOHNSON. No, sir; I did not have it at the time. I am not sure as to when it was received by the State Department. But let me say that on our thorium program, the Commission has established a limited quantity to be acquired for the research and development purposes. With the contracts now outstanding that requirement would be completed and fulfilled in about another year. For the past year we have not been contracting for additional thorium, although thorium has been offered to the Commission, because existing contracts would fulfill these requirements.

(Discussion off the record.)

Mr. JOHNSON. The Commission was not interested in extending its commitments for thorium, but the Commodity Credit Corporation is making an arrangement whereby it will take thorium in return for a wheat barter arrangement. This thorium will be available from the Commodity Credit Corporation to the Commission, if the Commission needs to acquire additional quantities. So we are fully protected on acquiring the stockpile quantities which have been established by the Commission for the research and development purposes.

Mr. CANNON. How do you account for this sudden action on the part of the administration of the Republic of Brazil?

Mr. JOHNSON. May I go off the record?

(Discussion off the record.)

Mr. CANNON. Is there any activity on the part of our sister Republics in South or Central America toward experimentation in the development of atomic energy?

Mr. JOHNSON. Yes, sir. I think nearly all of the countries are now greatly interested in the development of atomic energy.

Mr. CANNON. And are themselves studying it?

Mr. JOHNSON. Studying I think would be a correct term. But as far as development is concerned, Brazil has, I think, launched a moderate program, or at least planned one. But practically all of the countries now are extremely cooperative in regard to the sale and offering arrangements for sale of radioactive minerals to the United States.

(Discussion off the record.)

Mr. CANNON. You don't think there is need for additional commitments with any of the countries from which we are securing nuclear material other than those we have at present?

Mr. JOHNSON. I would put it this way. That the amount of uranium that we will receive under existing contracts and commitments, together with our own domestic production, which has been developed from nothing to a very high level, will meet our needs unless the requirements are expanded.

Mr. CANNON. Domestic sources do not include Canada?

Mr. JOHNSON. No. Additional uranium will be coming to the United States in fiscal year 1957 from North American sources.

Mr. CANNON. Any from Mexico?

Mr. JOHNSON. There is no uranium production in Mexico to our knowledge.

Mr. CANNON. Any further questions? Mr. Riley?

Mr. RILEY. Yes. Is there any possibility that Brazil is interested in making a contract with some other country?

Mr. JOHNSON. Under the arrangements we have had with Brazil, I think Brazil has agreed not to sell source materials to any unfriendly country.

Mr. CANNON. Mr. Evins.

EXTRACTION OF URANIUM FROM SHALES

Mr. EVINS. Thank you, Mr. Chairman. The Atomic Energy Commission has been making tests and explorations for the sources of uranium supply at various points throughout the Nation. I understand that their tests and discoveries have indicated that there is a source of uranium supply, but possibly in the low grade or low quality. What is the possibility of using that source of supply?

Mr. JOHNSON. I think, Mr. Congressman, you may be referring to the shales of Tennessee and the phosphate deposits of Florida.

Mr. EVINS. That is correct.

Mr. JOHNSON. We are continuing to do process development studies on developing an economic or at least the lowest cost methods of extracting uranium from these very low-grade materials. At the present time, it does not appear feasible that uranium will ever be recovered from shales at a cost competitive with the cost of extracting uranium from the conventional-type ores that we are now receiving, unless it is possible to develop such uranium production as a byproduct of the recovery of other types of materials.

For example, in 1952, when we were looking for new sources of uranium, we did considerable work on the leach-zone materials of Florida. As a source of uranium it would be a high-cost source. But it now appears that the uranium from that source may be produced at competitive prices as a byproduct as a result of private industry extracting both alumina and phosphate from a source that has been considered as a waste product in the past. It would add roughly some 365 million pounds of alumina a year, and 365 million pounds of P_2O_5, and additional uranium.

Mr. EVINS. But in extreme emergency these sources of supply could be utilized.

Mr. JOHNSON. That is right. we undertook the program in 1952, so that we would have available domestic sources to meet our requirement insofar as possible.

Mr. EVINS. Thank you.

Mr. CANNON. Mr. Jensen.

Mr. JENSEN. Mr. Johnson, what part of the uranium you are now using comes from the United States?

Mr. JOHNSON. Much of our current supply is coming from the United States.

(Discussion off the record.)

Mr. JENSEN. Are we giving any financial or technical assistance to Canada in the field of uranium exploration?

Mr. JOHNSON. We have been working with Canada, but with the exception of one mine or project, carried on in conjunction with the

Canadian Government several years ago, exploration in Canada is by private industry. Canada has followed the same pattern which we have used in this country of setting a pricing arrangement for ore to interest, stimulate, and encourage private exploration. The big discoveries of North America, both in the United States and Canada, have been made by private exploration, independent prospectors, small mining organizations, and large mining companies. We have had wide participation.

Mr. JENSEN. Thank you, Mr. Chairman.

PHYSICAL RESEARCH PROGRAM

JUSTIFICATION OF THE ESTIMATE

Mr. CANNON. We will now take up the physical research program and insert in the record pages 91 through 101 of the justifications.

(The justifications are as follows:)

PHYSICAL RESEARCH PROGRAM—OPERATING COSTS

Program statement

Estimate fiscal year 1957	$65,693,000
Estimate fiscal year 1956	52,619,000
Increase	13,074,000

The physical research program comprises basic and long-range investigations of the natural laws and materials that have special relevance to the Commission's activities and responsibilities. The investigations are in the fields of physics, chemistry, and metallurgy and are undertaken to improve our command of nuclear technology and to accelerate and expand the developments of the uses of atomic energy. In retrospect, every advance in atomic-energy capability can be traced to laboratory research of the type now carried on under this program. About 70 percent of the program is carried on in the Commission's laboratories. The remaining 30 percent is contracted principally to university laboratories where the work is closely integrated with postgraduate training in research.

Following are the areas where increases are proposed in fiscal year 1957:

Area	*Increase over fiscal year 1956*
Design and development of devices for physics research	$3,107,000
High-energy physics	2,111,000
Equipment not included in construction	1,957,000
Chemical properties and reactions	1,072,000
Nuclear structure and neutron physics	1,106,000
Computer development and mathematics research	1,000,000
Alloy theory and nature of solids	742,000
Other	1,979,000
Total	13,074,000

Summary of estimates by category

Category	Actual fiscal year 1955	Estimate fiscal year 1956	Estimate fiscal year 1957
1. Isotope distribution	$2,143,464	$1,920,000	$2,068,000
2. High energy physics	8,074,915	9,528,000	11,639,000
3. Nuclear structure and neutron physics	8,835,410	9,715,000	10,821,000
4. Extra-nuclear properties of matter	1,395,385	1,576,000	1,804,000
5. Design and development of devices for physics research	840,713	2,275,000	5,382,000
6. Computer development and mathematics research	40,000	115,000	1,115,000
7. Physical methods of isotope separation	389,689	883,000	1,220,000
8. Process chemistry	5,003,690	4,834,000	5,188,000
9. Classified project A	746,394	1,080,000	1,296,000
10. Chemical properties and reactions	8,792,581	10,867,000	11,939,000
11. Chemical isotope separation studies	553,903	1,017,000	1,513,000
12. Production, treatment, and properties of materials	2,272,903	2,019,000	2,019,000
13. Alloy theory and the nature of solids	1,397,291	2,223,000	2,965,000
14. Effects of irradiations on materials	870,190	1,098,000	1,298,000
15. University cooperation and training	199,733	200,000	200,000
16. Equipment not included in construction projects	2,992,738	3,269,000	5,226,000
Total physical research program	44,548,999	52,619,000	65,693,000

JUSTIFICATION OF CATEGORIES

1. Isotope distribution, $2,068,000

Radioactive and stable isotopes are produced for use in AEC research programs and for distribution to individuals, firms, and institutions licensed by the Commission to possess and use byproduct materials. Radioisotopes are distributed for use in industry, medicine, agriculture, and research. Stable isotopes are distributed for use in physical, biological, and medical research. The estimated receipts from sales and rentals are reflected in the "revenues applied" portion of the budget. The increase of $148,000 in fiscal year 1957 is offset by an increase in sales of $133,000; the $15,000 increase is for greater production of stable isotopes for AEC use.

2. High energy physics, $11,639,000

Studies in the high and ultrahigh energy regions will continue to add to the knowledge of nuclear forces and the nature of matter. The large accelerators operated under this category accelerate protons and other particles that in turn produce the many kinds of mesons which are of principal interest. These accelerators, which include the bevatron, cosmotron, and several university-located accelerators, are capable of more intensive operation than was possible under prior year budgets, and the demands for their use are greater than can be satisfied under present schedules. New developments such as the attainment of external beams, alternating gradient fields, attainment of higher energies and more intensive beams have resulted, and will continue to result, in the modifications of existing machines and have made the use of the devices much more effective than was previously possible. An increase of $2,111,000 is needed to support the staff, power, and instrumentation requirements for the more effective use of these high energy accelerators on a round-the-clock basis.

3. Nuclear structure and neutron physics, $10,821,000

The field of nuclear structure and neutron physics concerns itself with the properties of atomic nuclei and the production of new nuclear species. The properties of interest are the masses, energy levels, nuclear spins and magnetic moments, lifetimes, cross sections for transmutations by neutrons and other nuclei. The experimental techniques brought to bear on this problem involve the use of particle accelerators, nuclear reactors, and many new and different methods for the detection of nuclear radiation. The results of much of this research heave immediate relevance to the field of atomic energy, especially in the determination of cross sections needed by the other activities of the Commission. The level of this activity is being increased by $1,081,000 in fiscal year 1957. This increase is needed for the new heavy ion accelerators, which will be used for studies of distortion effects in light and heavy nuclei; neutron and proton penetration effects; and for programs utilizing other new instrumentation which has been under development during the current year. An increase of $50,000 is provided for the Enrico Fermi award. Section 157b.(3) of the Atomic Energy Act of 1954 authorized the Atomic Energy Commission upon recom-

mendation of the General Advisory Committee and the approval of the President to grant an award for any especially meritorious contribution to the development, use, or control of atomic energy. Enrico Fermi, as much as any individual, is responsible for the achievement of the release of atomic energy. In recognition of his achievements, an Enrico Fermi award will be established in the amount of $50,000 to be awarded not more often than annually on an international basis.

4. Extranuclear properties of matter, $1,804,000

Studies of the nonuclear properties of matter in the solid, liquid, and gaseous states are in this category. Extranuclear effects of neutrons, protons, electrons and photons, low-temperature effects, optical spectroscopy, and mathematical service computations are also included.

An increase of $228,000 is being budgeted in fiscal year 1957 for expansion of work at sites that have demonstrated their productiveness in this field.

5. Design and development of devices for physics research, $5,382,000

The principal major devices used for physics research are accelerators and related specialized equipment. The funds requested under this category are for the design and development of new devices for physics research and improvements to existing devices. The principal items on which there is a major design and development effort are high energy and high intensity accelerators and associated equipment such as bubble chambers and beam deflection systems. The increase of $3.1 million over fiscal year 1956 is chiefly for expanding design and development work in the field of high current accelerators at the University of California Radiation Laboratory, and high energy accelerator design studies being conducted by the Argonne National Laboratory and the Midwestern University Research Association.

6. Computer development and matematical research, $1,115,000

The highly complex, technical, and interrelated nature of the Commission's program has led to considerable dependence on the use of high speed automatic computers in almost all phases of its activities. Numerical computations are of growing importance in weapon design, reactor design, particle accelerator design, meteorology, the statistical aspects of fallout, Project Sherwood, plant design and operational analysis, geological surveys, process flow and a host of other applied activities. They are also assuming a dominent role in areas of basic research important to the AEC such as theoretical nuclear physics, chemistry, solid state, statistics, particle trajectories, theory of turbulence, magneto-hydrodynamics, thermodynamics, and meteorology. Computer development is also reflected in improved remote handling devices and servomechanisms. The increase of $1 million estimated in fiscal year 1957 is required to initiate a program of computer development and related mathematical research in university and industrial organizations. This will include such areas as systems design and component development aimed toward the development of faster computers with larger capacities. Computers currently available to the Commission, or under development, are not adequate to meet the Commission's current or projected needs in this field. It now appears possible to increase the speed of computing machines by a factor of 10–100. Just as the major steps taken in this field several years ago required stimulation by the Government, so will major advances at the present time require Government stimulation. It is expected that some of the developments initiated under this program will eventually lead to the construction of one or more high-speed large-scale machines.

The narrative pertaining to this category is included in the classified portion of the justification material.

7. Physical methods of isotope separation, $1,220,000
8. Process chemistry $5,188,000

This category covers research and development related to new or improved processes for the various chemical operations of the atomic energy program; mainly, the recovery and purification of uranium and thorium from their ores, and the processing of reactor fuels and blanket materials. Many different processing techniques are studied, including solvent extraction, ion exchange, precipitation, volatilization, and extraction with molten salts.

Solvent extraction processes are now widely used, and a major emphasis in studies in this field is on simplification and changes designed to effect economies in the chemical processing of reactor-irradiated materials. New philosophies in

equipment maintenance and waste treatment, for example, could be economically significant in the development of competitive nuclear power. Emphasis is also being placed on the development of the initial steps in these processes so that they may be applied to the various types of fuel elements used or evisioned for the different military and civilian power reactors.

The newer types of processing techniques are also being investigated. Fluoride volatility processes, which might involve distillation from molten fuel, "scrubbing" with molten salts, etc., would offer particular advantages for power reactor systems requiring only a partial removal of impurities and refabrication into the fuel element. Studies in support of the Metallex process for feed materials treatment are also being conducted. This process involves the direct reduction of the chlorides of uranium or thorium to the metal by use of a sodium-mercury amalgam.

Fundamental studies related to the Commisison's raw-materials program are also included in this category. Research on the geology, geochemistry, and mineralogy of uranium and thorium is of long-range importance to the understanding of how and where these materials are found in nature, and is conducted mainly at the United States Geological Survey and in university laboratories. Fundamental information related to the chemical treatment of the various types of ores is being developed. The chemistry of uranium in solutions encountered in ore processing is being studied, and new methods for the removal of uranium from its ores are being investigated. The extraction of uranium by organic amines dissolved in hydrocarbon solvents appears particularly promising, as does the application of the continuous ion exchange contactor.

Research and development requirements for materials such as neptunium and americium are increasing. These elements are produced in normal reactor operation, but are not recovered at present in the routine chemical operations. Some studies are therefore in progress on methods to recover these elements with a minimum of interference and cost.

For fiscal year 1957 an increase of $354,000 is requested for work in this category to allow for increased levels of effort in the investigation of processing various types of heterogeneous reactor fuels ($100,000), in the Metallex studies ($77,000), and in the development of needed chemical information directly applicable to the newer volotility and pyrochemical processing concepts ($177,000).

9. Classified project A, $1,296,000

The narrative pertaining to this category is included in the classified portion of the justification material.

10. Chemical properties and reactions, $11,939,000

Studies in this category represent a wide variety of long-range investigations in fields related to the interests of the Commission. These fundamental studies represent the core of the chemistry research program, and the knowledge gained therefrom will serve as an indispensable foundation for the future advancements in the chemical aspects of the application of nuclear energy. Programmatic or developmental work depends very heavily on fundamental knowledge of the properties and behavior of the materials being used. Without an adequate supply of such information, this work proceeds slowly and blindly.

Several areas of work can be differentiated in this category: nuclear chemistry and radiochemistry; physical and inorganic chemistry; organic chemistry; and radiation chemistry. The nuclear and radiochemistry research consists chiefly of studies of the formation and properties of the heavy elements and the fission products. Typical topics include: Study of the properties of isotopes of elements from plutonium through mendelevium (element 101), of which are produced by prolonged arradiation of plutonium or other heavy elements in the MTR or in accelerators such as the heavy-ion linear accelerator; reirradiation of some of the separated products from the previously mentioned irradiations to produce new isotopes and elecents; determination of fission-product yield distributions resulting from spontaneous fission and fission induced by various particles at different energies; chemical studies of the products of high-energy nuclear reactions induced by the revatron and cosmotron; the use of isotope tracers to investigate the equilibrium and reacton kinetic properties of isotopic compounds; and the chemical effects of nuclear transformations in colid, liquid, and gaseous systems.

Typical studies in the fields of physical and inorganic chemistry are: the properties of plutonium hexafluoride; the chemistry of nonaqueous solvent systems; the chemical properties of the actinide elements; surface chemistry, which

is of fundamental importance to corrosion phenomena, slurry stability, liquid-liquid extraction, etc.; mechanisms and kinetics of chemical reactions; chemistry of materials at high temperatures; the use of neutron diffraction, optical spectroscopy, the magnetic techniques to study the structure of chemical compounds; the ion exchange and solvent extraction behavior of the elements; research in ultra-high sensitivity mass-spectroscopy; etc.

The organic chemistry program is a relatively small one, and includes studies related to the special needs of the AEC program. The study of the properties of, and reactions in, organic solvents, the use of tracers to investigate reaction mechanisms, and the study of the hot-atom chemistry of organic compounds containing carbon–14 or other radioisotopes, are typical of the investigations in this area.

Radiation chemistry is of obvious importance to the atomic energy program, and is concerned with the fundamental investigation of the basic physical and chemical behavior of solids, liquids, and gases under various types of irradiation, such as neutrons, alpha particles, electrons, gamma rays, fission fragments, etc. A major effort is devoted to the radiation chemistry of aqueous solutions because of its importance to homogeneous reactor programs. Fundamental studies of radiation chemistry are also of great importance to the development of large-scale uses of nuclear radiation in industrial operations. For example, the development of the utilization of radiation for the promotion of chemical reactions will certainly depend in large part on the existence of an ample fund of basic information on the chemical effects of radiation.

Of the total increase of $1,072,000 requested in this category for fiscal year 1957, approximately $475,000 is required for an increase in the level of high-temperature chemistry program. Operation of the heavy ion linear accelerator at UCRL will commence in fiscal year 1957, and $150,000 will be required for research utilizing this device. The remainder of the increase is required to build up to an adequate level in the fields of high-energy nuclear chemistry, surface chemistry, chemistry of the heavy elements, fundamental radiation chemistry, plutonium hexafluoride chemistry, and aqueous reactor chemistry.

11. Chemical isotope separation studies, $1,513,000

The narrative pertaining to this category is included in the classified portion of the justification material.

12. Production, treatment, and properties of materials, $2,019,000

This program is devoted to research and development on metals, alloys, and ceramics that are of special interest to the Atomic Energy Commission. The requirements for materials in the atomic energy program are severe and often unique, and in many cases the efficiency or even the feasibility of a design or system depends upon the properties of the available materials. Since many of the operational factors in atomic energy are unusual, the conventional materials are unsuitable.

Much of the work in this category is on problems associated with the use of uranium, thorium, and plutonium as fissionable or fertile materials. Typical projects include the development of an improved process for producing thorium, research on the electrolytic refining of plutonium, and investigations of new alloys and heat-treatments of uranium alloys for extended life of fuel elements for production, power, or propulsion reactors.

This program is also concerned with non-fissionable materials, particularly those of interest as a fuel element clad, moderator, control rod, etc. Work is planned on: extraction processes for vanadium, niobium, yttrium, and the rare earths, and the metallurgical characteristics of these metals; the properties of graphite; the behavior of ceramics; and the physical metallurgy of zirconium Research and development on barriers for the gaseous diffusion process is included.

An additional and very important phase of the program is the study of corrosion and the development of corrosion-resistant alloys. Aside from the vital needs in this field in the present operations, many of the advanced reactor designs involve severe corrosion problems in handling circulated liquid metals, liquid salts, or high temperature water.

13. Alloy theory and the nature of solids, $2,965,000

The narrative pertaining to this category is included in the classified portion of the justification material.

14. Effects of irradiations on materials, $1,298,000

The narrative pertaining to this category is included in the classified portion of the justification material.

15. University cooperation and training, $200,000

This activity comprise a group of educational and training functions performed for the Commission by the Oak Ridge Institute of Nuclear Studies. The objectives are to increase the number of scientific and technical personnel trained in the field of atomic energy, and to foster new research interest in nuclear and related sciences in colleges and universities in support of the Oak Ridge program. The changes in level of the several programs are as follows:

Program	Fiscal year 1956	Fiscal year 1957	Change
Resident graduate	$38,250	$38,250	0
Research participation	45,400	46,675	+$1,275
Special training	42,525	32,500	−10,025
Oak Ridge graduate	32,225	40,975	+8,750
Other training	41,600	41,600	0

16. Equipment not included in construction projects, $5,226,000

This category provides for the equipment required to carry on the research conducted under the physical research program. In addition to the equipment directly related to projects in the physical research program, provision is made also for general purpose equipment at the Ames Laboratory, and the Brookhaven and Oak Ridge National Laboratories that cannot be assigned to any specific program.

The cost of equipment is expected to increase from the 1956 level of $3,269,000 to $5,226,000 in 1957. A distribution of the estimate of costs for 1957 between replacements and additional equipment is shown, by office, in the following table.

Office	Replacements	Additional
San Francisco	$200,000	$1,468,000
Oak Ridge	1,027,000	431,000
Washington	133,000	867,000
New York	300,000	372,000
Chicago	307,000	113,000
Schenectady	8,000	0
Total	1,975,000	3,251,000

Approximately 80 percent of the total estimate comprises laboratory and shop equipment related primarily to scientific research projects. The remaining 20 percent is for other categories of equipment required, such as motor vehicles, security and protection equipment, and office furniture and machines.

Replacement equipment consists principally of laboratory equipment to replace wornout and obsolete items. The request for additional equipment is based on past experience, and known requirements for several costly nonrecurring items such as the bubble chamber and beam extractor for the Bevatron ($1,050,000), a high intensity linear electron accelerator to be used for determination of neutron cross sections ($500,000), and a computer for use at the Brookhaven National Laboratory ($250,000).

GENERAL STATEMENT

Mr. CANNON. General Fields, we will be glad if you will give us a statement on this program.

Mr. FIELDS. Yes, sir. The physical research program is covered in general terms on page 91. We are estimating the cost of this program for fiscal year 1957 to be $65,693,000. That is an increase of roughly $13 million over our estimated fiscal year 1956 cost.

This program covers basic and long range investigations of materials, their behaviors, characteristics, and it entails investigations into the nuclear, metallurgical and chemical properties of these materials. It is basic research and to a certain extent goes further than that to applied research in the sense of looking at processes for use in the development of material for our program.

It is also concerned with the operation of very powerful tools, such as the high energy accelerators, which have been built in the past, and we are now building newly developed high energy machines. These are the machines which, as the chairman has stated, in the past year were used in the discovery of a new nuclear particle, namely, the antiproton.

Now, as to the chemistry of the materials which we need in our program. There are the special materials which are the heavier elements of uranium, plutonium, and thorium. There is a great deal of the chemistry of these materials yet to be developed. We have developed a good bit, but there is a long way to go with respect to these materials.

There are additional materials which are not in the heavier elements but which are necessary in our programs, either for the reactor program or are of general application. Here we are particularly concerned with high temperature chemistry. We must operate reactors at much higher temperatures than is possible with materials now available, if we are to get truly economical power.

Mr. CANNON. That applies not only to the development of atomic energy, but also to the development of materials and alloys which will stand the excessive temperatures in the production of high speed airplanes?

Mr. FIELDS. That is true, sir. They are related, and the problem is similar. One of the developments of the past year had to do with an alloy of aluminum which we have developed specifically for our needs. Out of this research comes the possibility of a material which will withstand temperatures of up to 300°, 350° C. Before this development, the limitation was 200°. This is the sort of thing which results from the basic chemistry and process chemistry work carried on under this budget.

Similarly, there is a need to expand work in the field of metallurgy, which deals with the behavior of the metals themselves, as opposed to their chemistry. The question is how do they expand, and how do they behave under irradiation? In our program, materials generally are exposed to intense irradiation, particularly in a reactor. Under irradiation, these materials may expand, they may contract, or they may develop fission products so that their behavior changes. This has a very specific effect on what you can do with the materials, how long you can leave them in a reactor, and how long you can keep a fuel charge in a reactor and have it burn.

In this broad field we are looking at the basic processes in the fields of nuclear physics, chemistry, and metallurgy. We do much of this work in our own laboratories. About 70 percent of the money requested would be expended in the Commission's laboratories, ininclding the Argonne National Laboratory, Oak Ridge National Laboratory, Brookhaven National Laboratory, Berkeley Radiation Laboratory, and the Ames Laboratory in Iowa.

Also, about 30 percent of this program is carried out under contracts with various universities in this country. These are specific contracts for specific research projects. It is our belief that in these basic fields we get good results by contracting for the top talent in a particular field. By placing specific contracts for the services of individuals who have outstanding abilities in chemistry and in metallurgy, a great deal of broadening of the effort is obtained and the services of the top talent of the country are brought into the program.

Mr. CANNON. Off the record.

(Discussion off the record.)

Mr. CANNON. On the record.

ASSISTANCE FROM UNIVERSITY AND OTHER PRIVATE LABORATORIES

You tell us, General Fields, in the justifications here, that every advance in atomic-energy capability can be traced to laboratory research of the type being carried on under this program.

Now, there is something I want to ask you about. You have been talking about your isolation of the antiproton, your high-temperature chemistry, your development of an alloy of aluminum, metallurgy, and radiation studies. Have all of those five things been developed in Government laboratories or have any of them come from university or other private laboratories?

Mr. FIELDS. I believe the ones I mentioned specifically to you were done in our Government laboratories in this last year.

Mr. CANNON. Would you say that the progress made in atomic energy chemistry and metallurgy has been made exclusively in Government laboratories or have you had assistance from outside?

Mr. FIELDS. We have had a great deal of assistance from outside. I would like Dr. McDaniel to speak specifically to this point because I am not a research scientist. I am, however, under the impression that many of the new discoveries do come from the universities and that not all discoveries are made in our Government laboratories. I was attempting here to show what we had done in the past year specifically with our own efforts.

Mr. CANNON. That is a particularly interesting matter just now, General Fields, because the Government today is spending more money for research than it has ever spent before for that purpose, and it is spending more money for research than it is spending for any other single activity, and that is true in all departments. It is impossible to escape the conclusion that at times we may not be getting value received. Too often when studying in a Government-supported laboratory or a Government-financed research, the results seem to be sterile. On the other hand someone working in inadequate quarters or some doctor working on his own in an obscure hospital laboratory will develop the very thing we have been trying to get. Is it possible that some of this enormous expenditure for research may at times be wasted? Do you think that from the money we have provided here for research you are getting full value received?

Mr. FIELDS. Yes, sir; I do. I think we are getting value received. I believe this because of the results which have been obtained and the progress which has been made in the program because of those results.

Let me tell you one of the research projects that was going on about 5 years ago when I came back to the Atomic Energy Commission. I can recall at Oak Ridge they were doing research on separations of isotopes. We have talked about this before.

(Discussion off the record.)

Mr. PHILLIPS. It was contracted out to a private company?

Mr. FIELDS. I am not sure of that. You mean this particular research?

Mr. PHILLIPS. Was it not?

Mr. FIELDS. The laboratories were operated by a private company, that is true. It was done at the Oak Ridge National Laboratory which is operated by Carbide & Carbon Chemical Co.

Mr. PHILLIPS. Doesn't that confirm what the chairman has been contending?

Mr. FIELDS. I am not sure I follow you, sir.

Mr. PHILLIPS. Mr. Chairman, I did not mean to interrupt. I am supporting you, sir.

Mr. CANNON. I am glad to have the gentleman's invaluable cooperation.

Mr. PHILLIPS. I am just saying that this laboratory was operated by a private company, and that is where some of these outstanding achievements have been made. I hold the same view as the chairman does, that if we were to let our research become Government supported, the days of the United States would be numbered.

Mr. FIELDS. I agree with you. The research we are supporting is for research directly aimed at real advance to our program. You understand that.

Mr. PHILLIPS. Right, and I am not objecting to your doing it provided you give a free hand, as the chairman says, to private research and personal research which quite often, when you get into figures of this kind, has to have financial help of some kind.

Mr. FIELDS. That is correct.

Mr. CANNON. I am very glad to have the gentleman from California emphasize that phase. It is today a problem in practically every budget. And some of the most important discoveries are made without Federal collaboration. The development of penicillin was the product of a private laboratory. The observations of the gentleman from California are pertinent to the consideration of all our budgets, and especially the atomic energy budget.

INCREASE FOR HIGH ENERGY ACCELERATION

Mr. FIELDS. Mr. Chairman, I will only make a remark as to the reasons for the increases in this program. They are largely due to the greater utilization of existing high energy accelerators in physics research and the beginning of operation of new high energy accelerators which have been built. Some increases are due to more work to be done in chemistry and metallurgy, and as I have indicated, particularly in the high temperature field, and also for the initiation of a program for development of fast computers.

Mr. CANNON. But your budget here reflects largely a desire for expansion of your present facilities. You have not introduced any new activity in your budget. It is all additional appropriations for present activities.

Mr. FIELDS. That is true, sir.

Mr. CANNON. I notice you say here on page 93:

> Accelerators, are capable of more intensive operation than was possible under prior year budgets.

That part of your statement which follows, is to the effect that lack of knowledge rather than lack of funds, was responsible for the limitations of their use.

Mr. FILEDS. It was due to the status of the projects at the time, that a limitation existed on the use of them. Yes, sir.

Mr. CANNON. But you are making satisfactory progress.

Mr. FIELDS. Yes, sir.

Mr. CANNON. And there is every prospect that you will make further progress commensurate with the additional amounts requested?

Mr. FIELDS. Yes, sir.

Mr. CANNON. I note also, General Fields, that the Enrico Fermi award will be awarded annually on an international basis. Does that mean that a Soviet scientist might win the award?

Mr. FIELDS. It is on an international basis, and I don't believe there is a criteria developed which limits it, except that it is to be for outstanding achievement in the field of atomic energy.

Mr. CANNON. Regardless of the country from which that achievement comes?

Mr. FIELDS. Regardless of the country in which that was done.

Mr. CANNON. Are American scientists to be permitted to participate, or is it available only to scientists from abroad.

Mr. FIELDS. Scientists throughout the world are eligible for it, sir. This year it was awarded to Dr. von Neumann, who is an outstanding mathematician, originally with the Institute of Advanced Studies at Princeton. He is an American citizen, sir.

Chairman CANNON. There can be no ground for charges that we may be prejudiced in favor of American scientists in making this award?

Mr. FIELDS. I do not believe so, sir. Of course, this is the first year for this award, and this time it was awarded to an American.

DECREASE FOR RESEARCH IN EXTRANUCLEAR PROPERTIES

Mr. CANNON. Here is a welcome innovation in the budget, your estimate of your needs for research in the extranuclear properties of matter are more modest than they were last year. The item for extranuclear properties of matter is less than last year, when you estimated your 1956 needs would be $2,056,000. Apparently you are not expanding your activities in that field. What is the ground for that decrease?

Mr. FIELDS. Is this item 4, sir, extranuclear properties of matter?

Mr. CANNON. The second paragraph gives us an impression that last year this item was $1,804,000, minus $228,000, or in all $1,576,000, whereas actually your 1956 estimate was $2,086,000.

Mr. FIELDS. It was due to a reprograming of the work. I don't know the details at the moment, but there was a decrease.

Mr. CANNON. Far be it from this committee to discourage any reduction in estimates or expenditures, and it is our hope that the development of modern methods and the completion of capital structures

will make it possible to eventually reduce all or most of your estimates, and your expenditures.

This does not mean any decrease in achievement; it merely means you are accomplishing the same work with less expenditure?

Mr. FIELDS. I believe that is true. I would have to check just what did happen in this particular case.

Mr. CANNON. You may supply that for the record.

Mr. FIELDS. Yes, sir. I think it is probably due to reprograming, and it could be that something could not be undertaken at the moment that caused that.

Mr. CANNON. It may be that you had shifted some of the work to some other item.

Mr. FIELDS. Yes, sir.

Mr. CANNON. If so, we would like to know that.

Mr. FIELDS. Yes, sir.

Mr. CANNON. But we would like to know if this is an indication that you are securing the same results with less money.

Mr. FIELDS. Yes, sir.

Mr. CANNON. We think all Government activities should take into consideration the fact that as time passes and formulas are improved and methods of operation are shortened, and mass production is attained, we will secure the same results for less expenditure.

Mr. FIELDS. Yes, sir.

(The information is as follows:)

The decrease of $510,000 from the amount of $2,086,000 shown in the original fiscal year 1956 budget for extra nuclear properties of matter and the current estimate of $1,576,000 results from the fact that some work originally budgeted under this category is included in the fiscal year 1956 column of the fiscal year 1957 budget under other categories in the physical research program, one of which is a new category, Computer development and mathematics research, established subsequent to the preparation of the fiscal year 1956 budget.

Mr. CANNON. With reference to the classified project, do AEC expenditures involve the transfer of funds to any other agency, or are they all expended by AEC? Apparently here other agencies would be concerned with this project. It is not very clear as to the source of the funds used for that purpose.

Dr. MCDANIEL. These funds are all expended by AEC or its contractors.

Mr. CANNON. You do not allot money to any other agency?

Dr. MCDANIEL. That is correct, sir.

Mr. FIELDS. For this purpose we do not, sir.

PRODUCTION, TREATMENT, AND PROPERTIES OF MATERIALS

Mr. CANNON. In your item "Production, treatment, and properties of materials," page 98. It is a little unusual in that the request for next year is identical with your estimate of cost for this year. Last year your estimate was considerably larger than it is apparently turning out to be at this time. Can that be interpreted to mean that your progress is greater than anticipated?

Mr. FIELDS. We believe the conduct of the work at that level should be sufficient for our purposes in this fiscal year. I think the interpretation you should place upon it is that its continuation at the present level should produce the results we would like to obtain.

AVAILABILITY OF RESEARCH INFORMATION

Mr. CANNON. In comparison with the fiscal year 1956, when the estimate was $3,203,000. To what extent, General Fields, has your progress in this particular area been made available to industry?

Mr. FIELDS. I cannot segregate information in this particular area by itself, sir. We make it a practice to make information available to industry, including classified information. we issue technical reports and bibliographies. All industries and institutions can have the unclassified reports which are available. Many of these are published by the Superintendent of Documents and are available for sale by the Superintendent of Documents. That is, the unclassified literature that is available in this manner. There is a great volume of such unclassified information available. A great deal of the work done in this basic research program is, of course, unclassified.

Mr. CANNON. It is the policy of the Commission to share with industry all unclassified information which might be of value?

Mr. FIELDS. The Atomic Energy Act of 1954 requires that we promote the dissemination of information to the public. It is one of basic policies of the Atomic Energy Act.

Mr. CANNON. Is that done periodically or as information is developed?

Mr. FIELDS. It is done currently and continuously as information is developed by means of issuances as the papers are produced and by means of the issuances of monthly bibliographies and periodicals. This procedure is followed in the unclassified field. In the classified field information is being made available under the access-permit program which was referred to, I believe, day before yesterday. American industry and American institutions, by meeting certain criteria, can have access to classified material of certain types. This does not include weapons information, but does include chemical, metallurgical, and physical research reports, and reports on the development of reactors.

SECURITY MEASURES

Mr. CANNON. As you know, the acuteness of our present situation and its development 2 or 3 years in advance of anything that was anticipated is due to the unwarranted and unauthorized release of information, clandestinely or otherwise, to Russia. Are you taking precaution to see that no recurrence of that purloining of information from the AEC is possible?

Mr. FIELDS. I would say that we are. As you know, we operate under classified programs throughout our enterprise. We have a security program and system which was inaugurated during the war. It has been in constant operation since that time. I think it is a very effective security system which insures, to a large extent, the prevention of the occurrences to which you refer. You cannot, of course, guarantee that such leaks will not happen again, and we are always worried about this possibility.

Mr. CANNON. It is incredible, but the treachery of scientists in the most sensitive positions in your work and similar national-defense work has menaced the peace of the world. Is there any development of any international sentiment that nationalism is a sin rather than a

virtue which might bring about the justification for any revelation of the results of your work of which you have had any evidence?

Mr. FIELDS. I have not seen any evidence of it.

Mr. CANNON. Such men justify their treason by saying, "Scientists do not belong to any nation," that knowledge knows no narrow national bounds; that it is a world cult, and therefore should be available to all mankind as well as to their own nation, which has supported them, and which has made possible the development of this information.

Mr. FIELDS. The shocking part of the disclosures made in the years in the past, was their taking unto themselves the decision that this was the thing to do. Unfortunately, an individual of this sort is the one who would be most likely to do it if he has an inclination to view things in that manner.

Mr. CANNON. I trust every precaution is being taken to prevent such occurrences?

Mr. FIELDS. Yes, sir. We have a security system which for direct Government employees requires a full background investigation by the Federal Bureau of Investigation or the Civil Service Commission, depending upon the category of clearance, before their employment by the Government. This is true of direct Government employees. It is also true of all employees, including contractor employees, at our Government installations where classified work is done. An investigation is conducted, a very thorough one, before they are granted access to classified information.

TRAINING IN PHYSICAL RESEARCH

Mr. CANNON. The item for university cooperation and training, discussed on page 99 seems to be a very important item. I wish you would tell us how this money is spent and how the training differs from that which is part of the reactor development program.

Mr. FIELDS. I will ask Dr. McDaniel to cover this item. He is the Deputy Director of the Research Division. Essentially it covers the program conducted by the Oak Ridge Institute of Nuclear Studies for the training of personnel in the fields of physical sciences which pertain to atomic energy. This is different from the training which we are conducting in the reactor schools at Oak Ridge and at Argonne.

Mr. CANNON. It is different in what respect?

Mr. FIELDS. It deals with physical research in the area of instrumentation and radiological physics rather than with reactors themselves.

Dr. MCDANIEL. The Oak Ridge Institute of Nuclear Studies conducts each year a program of training in radioisotope tracing techniques. Thirty-two students are admitted to each class, and there are usually six classes per year. That accounts for $32,500 of the item "Special training" on page 100 of the budget.

There is also a resident graduate training program which allows employees at Oak Ridge to continue graduate studies and to do research at the Oak Ridge National Laboratories, which accounts for an additional $38,250. There is an Oak Ridge traveling lecturer program in which scientists from the Oak Ridge area visit universities, high schools, and other sponsoring institutions. Last year 165 lectures were

given at 140 different locations in the South and Southeast; 11 of these lectures were given by representatives of the Oak Ridge National Laboratory. In general, this $200,000 is for these types of activity and does differ from the specialized training in reactor development also offered at the Oak Ridge laboratory.

Mr. CANNON. It is working out satisfactorily?

Dr. MCDANIEL. Very satisfactorily.

OFF-SITE RESEARCH CONTRACTS

Mr. CANNON. Again under the heading "Equipment Not Included in Construction Projects," I see you are allotting to Washington $867,000 for additional equipment. That addition to this physical research equipment is a rather considerable increase. Could you tell us the need for the additional amount?

Mr. FIELDS. Yes, sir; this is equipment which would be used in conjunction with research contracts at different universities sites, not at our own laboratories, and the level of this program is such that the need for equipment has been increasing. In order that these research contracts can be carried on effectively, we do need the increase in equipment for support of the program.

Mr. CANNON. How many institutions are involved?

Dr. MCDANIEL. In the neighborhood of 300.

Mr. CANNON. Is it a widely distributed program?

Mr. FIELDS. That is right.

Mr. CANNON. On the following page you state "for other categories of equipment." Is that also intended for Washington?

Mr. FIELDS. I believe this item is with respect to the equipment item in total.

Mr. MCCARTHY. I might explain that the designation "Washington" means controlled from Washington. The off-site contracts for research are controlled from here. None of it is used in Washington but it is Washington controlled.

Mr. RILEY. General Fields, what type of research do you do; you contract with independent laboratories and college laboratories?

Mr. FIELDS. This would be for work in any of the scientific disciplines, including physical research, chemistry research, metallurgy research, depending upon the talents of the staff concerned. If they could do useful research, and we could see the possibility of results, we contract with them for this type of work, sir.

Mr. RILEY. Do you contract with them for research in the security program?

Mr. FIELDS. No, sir.

Mr. RILEY. That is all done by the Government?

Mr. FIELDS. That is all done by Government; yes, sir.

Mr. RILEY. So that you have no security problem with your independent laboratories?

Mr. FIELDS. No, sir. If it is a classified project research we would have to have a security clearance for the individuals concerned. But we do not have a program of security other than for the clearance of the individuals involved and the inspection of the installation if classified material is involved.

Mr. RILEY. But if you do have a classified research program, you require the same security measures for the independent laboratory people as you do your own?

Mr. FIELDS. That is correct, sir. Now, the majority of the 300 off-site contracts are generally for unclassified research. It is basic research which is generally unclassified. But if the contract is for classified research, the same standards and procedures are used in the clearance of personnel and the facility as would be if the work were performed in our own laboratories.

Mr. RILEY. Do you make available to these independent research contractors such information as the Government may have developed in their particular program?

Mr. FIELDS. I believe we do insofar as that information pertains to the advancement of his work; yes, sir.

Mr. RILEY. In other words, you do not start them from scratch, and let them develop their own?

Mr. FIELDS. Quite often they are ahead of us, sir. That is the reason we go to them.

Mr. RILEY. I am very much interested in that. I have discussed it with some of the college people, and they think that you obtain very fine results by giving financial aid through these contracts to these research programs in the college laboratories.

Mr. FIELDS. It is perfectly true and there are a great many scientists who prefer the academic atmosphere of the university and who are outstanding men. They do not like to locate and work full time in a Government laboratory. They are interested in a particular field of science, and want to follow that. At the same time they are perfectly willing to work on our projects in their own laboratories.

Mr. RILEY. The same thing is true in industry, too, I believe. I think many scientists would rather have the freedom of research that is available on a college campus. A great many of them are not too much concerned about the monetary return. They simply want an opportunity to search for knowledge of the problem. However, they do have to have somebody to underwrite the financial requirements to keep them going. Is that right?

Mr. FIELDS. That is correct, sir.

Mr. RILEY. That is all.

Mr. CANNON. Mr. Evins.

Mr. EVINS. Supplementing what our chairman and Mr. Riley have said, and in connection with private industry making these discoveries, I think that it might be well to emphasize for the record that while private industry may have made discoveries, it is the Government that has provided the initiative and also the financial support which made it possible. Therefore, it is a cooperative thing with private industry and Government that has brought about these discoveries and is continuing to make these discoveries. Is that not correct, General Fields?

Mr. RILEY. Will the gentleman yield? I believe it stipulates private research and development.

Mr. PHILLIPS. Would you change the word "discovery" to "development"?

Mr. EVINS. Yes, either one or both, but I want to insure the Government participation in these programs and not have the record

appear that it is solely a private industry development. Please comment, General Fields.

Mr. JENSEN. Of course that is academic. You know that it is a cooperating program and private industry is cooperating with the Atomic Energy Commission, and the Atomic Energy Commission is cooperating with private industry.

Mr. FIELDS. Certainly. I should think the best results would come out of a cooperative program.

Mr. EVINS. Certainly, but by providing the appropriation the Government is establishing the initiative in many instances.

Mr. FIELDS. In providing the moneys in our budgets, you are permitting us to follow the developments for the application thereof to our program. You are also, as a result from time to time, getting new discoveries. This is a very definite benefit.

On the other hand, by no means is this the only place where discoveries come from.

Mr. EVINS. I understand that, but the Government through the Atomic Energy Commission is providing leadership; the taxpayers are providing funds through appropriations, you will agree to that?

Mr. FIELDS. I think it is providing a great deal of the leadership; yes.

Mr. EVINS. Thank you, Mr. Chairman.

Mr. JENSEN. And the Government is receiving their finances from private enterprise, taxes, and taxes from the rest of the people to carry on this program. If it were not for the taxpayers of America, you would have no Atomic Energy Commission, because you fellows would not like to work for nothing. You work for pretty small wages, at best, comparatively speaking, with other people of your abilities, but the fact still remains that money does not grow on trees. The fact still remains that it is a cooperating program between private industry and Government and that is the way we want to keep it.

Mr. CANNON. Mr. Phillips.

Mr. PHILLIPS. What I was trying to say, Mr. Evins, is that he was looking on the Government as an entity, as if it were an individual. The discoveries are made by individuals, and Government helps them in the development of them, if you will permit that correction, and Government is not an entity. Government, as Mr. Jensen pointed out, is a collection agency, taking money from these people, and putting it in their pockets and taking off a little commission, you understand, for the overhead and then giving it back for the development for the benefit of the people. If you will accept that change of the word, I will go along with you.

Mr. CANNON. The gentleman accepts that amendment?

Mr. EVINS. The suggestion is accepted.

Mr. PHILLIPS. On page 91 you state that 70 percent of the program is done in Commission-owned laboratories, General Fields, and 30 percent is in off-site laboratories. How do you make your quantitative decision, on the basis of the money spent or on the basis of the amount of work, hours, or something like that?

Mr. FIELDS. It is on the basis of the money spent, sir.

Mr. PHILLIPS. Then it surprises me, and I am a little stunned by it that 70 percent of the program should be carried on in the Com-

mission's laboratories. When you say Commission's laboratories would you include Berkeley as a Commission laboratory?

Mr. FIELDS. Yes, sir, very much so. The Commission laboratories referred to here include the radiation laboratory at Berkeley, the Argonne Laboratory and the others previously mentioned.

Mr. PHILLIPS. Let me say it is a little doubtful. It is the Commission laboratory in the sense you paid for it, but it is operated by the university.

Mr. FIELDS. It is operated by the University of California.

Mr. PHILLIPS. Just like MIT or Ames or any other place.

Mr. FIELDS. Yes, sir.

Mr. PHILLIPS. Actually you have very few what might be called Commission laboratories in the sense that you own them, you built them, you put in your own people and pay those people to operate them.

Mr. FIELDS. We have none in this program that are operated directly by Government employees.

Mr. PHILLIPS. Therefore, 70 percent and 30 percent really requires a definition as to what you mean.

Mr. FIELDS. I think perhaps the definition should be that the 70 percent is done in central laboratories which are operated under contracts with the Commission.

The laboratories are largely owned by the Government sir, in that we built the installations.

Mr. PHILLIPS. When you talk of laboratories you are talking of locations like Berkeley, which require the expenditure of money which no university could undertake.

Mr. FIELDS. That is correct.

Mr. PHILLIPS. Therefore, the Federal Government obviously put up the money to build that, and then contracted, or whatever the legal relationship might be, with the university to operate it, and I think it is really, General, wrongly called a Commission laboratory. I think you should say a Commission-financed laboratory, or a central laboratory, or something like that, because it does give the wrong impression that 70 percent of research is being carried on under Government control and expense.

The next thing people will think that you are going to have a civil-service program in these laboratories which would still further shorten the future of the United States.

On page 99, I wonder why you are spending so little money?

Mr. FIELDS. On which program, sir?

Mr. PHILLIPS. On item 15. I would like to double that and take an equivalent amount of money or a little more from some of the other programs, General. Would that be all right?

Mr. FIELDS. I don't know what the possibilities are for expanding more for that particular program, sir.

Mr. PHILLIPS. We spent a great deal of time Wednesday and Thursday discussing the possibility, especially my colleague on my left, discussing the possibility of getting interest, enthusiasm, knowledge of this program out, and then you spend what in effect is petty cash on that program.

Mr. FIELDS. I am sure, sir, that program would have to be increased if we followed some of the suggestions here, such as working with

PTA's, Boy Scouts of America. These are very good suggestions, and expenditures for this item would have to be increased if we were to undertake them.

Mr. PHILLIPS. Would it be a good idea to take some money from the other programs and place it there?

That is all, Mr. Chairman.

Mr. CANNON. Mr. Jensen.

Mr. JENSEN. I have no questions, Mr. Chairman.

BIOLOGY AND MEDICINE PROGRAM

JUSTIFICATION OF THE ESTIMATE

Mr. CANNON. Turning now to the biology and medicine program, we will insert at this point in the record pages 106 to 121, inclusive, of the justification.

(The pages of the justification follow:)

BIOLOGY AND MEDICINE PROGRAM—OPERATING COSTS

Program statement

Estimate fiscal year 1957	$31,527,000
Estimate fiscal year 1956	29,172,000
Increase	2,355,000

The fiscal year 1957 budget request for the research program in biology and medicine includes an increase of $2,355,000 for additional requirements.

Effort directed to the maintenance of the health and protection of people in atomic-energy matters continues to be a primary function of this program. Increased emphasis will be placed in pursuing promising research leads and exploring new medical and biological uses of atomic energy, particularly as these relate to the needs of the tremendously expanding industrial utilization of atomic energy.

General areas of expansion include:

1. Development of research projects in radiation recovery and the genetic effects of radiation in the lower ranges (mammalian studies) at the Oak Ridge National Laboratory.

2. Increase of scientific and technical staff of the medical department, Brookhaven National Laboratory, to achieve more effective utilization of the new medical center and medical reactor.

3. Additional emphasis to be placed in the research program of the Atomic Bomb Casualty Commission in Japan. This will enable progress to be made in such studies as the life-shortening effects of radiation, an augmented clinical and pathological program to better document causes of death of survivors, and the development of radioisotope use techniques for studying the bone-marrow activity.

4. An item for civil effects testing activities. This will fulfill a much-needed requirement for determination of the effects of nuclear explosions on materials, and will include studies on physical and biological damage, radiation, blast, and thermal instrumentation not otherwise provided for.

5. Moderate expansion in radiation instrumentation to fulfill the need for developing new primary sensing devices, such as scintillation crystals, liquid scintillators, and semiconductors.

6. An increase in funds for the support of university and hospital research projects. In addition to serving as a stimulus for beneficial and humanitarian utilization of atomic energy, research conducted under this program continues to provide the Commission with data not otherwise available.

The biological and medical research program is conducted in 16 Commission-operated laboratories which is estimated to cost $23,250,000 in 1957, and through the support of approximately 425 individual university and hospital research projects which is estimated to cost $8,300,000 in 1957.

Summary of estimates by category

Category	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
1. Radiation effects on biological systems	$8,821,707	$8,730,000	$9,486,000
2. Combating radiation detrimental effects	1,984,580	1,915,000	2,053,000
3. Beneficial applications of atomic energy	8,495,934	9,611,000	10,172,000
4. Biomedical problems in atomic energy operations	5,082,186	5,130,000	5,809,000
5. Dosimetry and instrumentation	2,287,087	2,095,000	2,365,000
6. Vocational and special training	459,281	474,000	570,000
7. Equipment not included in construction projects	1,010,641	1,217,000	1,072,000
Total biology and medicine program costs	28,120,416	29,172,000	31,527,000

JUSTIFICATION OF CATEGORIES

1. Radiation effects on biological systems, $9,486,000

The Commission's special interests in the biological effects of radiation arise from the incidental or accidental exposure of plants and animals during present and future uses of atomic energy in laboratory research, in production of power for industry and transportation, in other peacetime uses of atomic energy, and in radiological warfare. While the main concern about radiological hazards is focused on man, an understanding of the nature and magnitude of the hazard can be gained only from studies on experimental plants and animals.

(a) Medical research: Fiscal year 1956, $3,775,000; fiscal year 1957, $4,149,000.—The fundamental problems in this category which medical research will continue to study in fiscal year 1957 include:

(1) The mechanism of radiation damage to the blood-forming tissues. Emphasis on the effects of radiation on blood pigment (hemoglobin) and white cell metabolism as well as continuing studies on interference of radiation with the function of enzymatic reactions involved in the production of essential parts of blood cells and the release of new cells into the circulation;

(2) The changes taking place in blood and blood vessels after radiation which result in hemorrhage. Some shift in studies to the effects of radiation and drugs on the intercellular supporting tissue of the blood vessels as well as further efforts to define the mechanism of interference by radiation with the complex process of coagulation;

(3) The mechanism by which radiation increases suceptibility to infection. Emphasis on studies related to the effects of radiation on blood proteins important in the defense mechanism against infection and continuing studies on the other aspects of radiation-caused breakdown of normal body defenses;

(4) The effects of radiation on the body's general metabolic regulation. Special emphasis on the effect of diet and hormones on work performance impaired by radiation and the possible damaging effect of proteinlike substances released from the irradiated intestine, as well as disturbances in the balance between rates of various enzymatic activities and energy-transferring reactions;

(5) Mechanism of radiation-induced impairment in mental functions. Emphasis on the kinds of brain damage produced by radiation administered at various stages of fetal development.

The Atomic Bomb Casualty Commission program in Japan, in fiscal year 1957, will enter its 12th year of studies on the long-range medical and biological effects of the atom bomb on man. The intensive medical surveys of the populations in Hiroshima and Nagasaki will be expanded to include a longevity study and will include further evaluation of the increased incidence of leukemia and complications of the eye.

(b) Biological research: Fiscal year 1956, $4,704,000; fiscal year 1957, $5,093,000.—The biological research program in this category is arranged so that it deals with both the long-range (genetic) and the immediate (somatic) effects of radiation.

The objectives of the genetic research program are:

(1) To predict the effects of measured amounts of radiation on the genetic constitution of plants and animals, and thereby to gain knowledge

calculated to enable better prediction of the effects on the human genetic structure;

(2) To discover ways of altering the genetic constitution of plants and animals in desired directions; and

(3) To uncover as much fundamental knowledge as possible about the genetic effects of radiation to assist in reaching the first and second objectives.

To accomplish these objectives, the genetic research program deals with the effects of radiation on genes in a wide variety of organisms (mutation rate studies), on chromosome breakage and recombination (cytogenetic studies), with the effects of radiation-induced mutant genes on the biochemistry, physiology, and development of organism (physiological genetic studies), and with the effects of mutant genes on the adaptive properties of natural and domesticated populations of plants and animals (population genetics).

The objectives of the somatic research program are:

(1) To predict the relative amounts of somatic damage arising from various kinds of radiation, applied in a variety of ways to living organisms;

(2) To analyze in detail the mechanisms of the somatic effects of radiation to furnish a logical basis for the development of protective and combative measures against radiation.

The objectives are approached in the somatic research program by studying the effects of radiation on the metabolism, behavior, development, and survival of plants, animals, and their parts and by studying the effects of radiation on enzymes, nucleoproteins, phospholipids, and other essential constituents of cells and biological fluids.

Research on the genetic and somatic effects of radiation will include studies on the toxicity of internal beta ray radioisotopes, of X-rays and gamma rays, and of neutrons; the susceptibility of cell parts to radiation; the effects of radiation on cell division; the biochemical changes induced by irradiation; the physiological and genetic effects of radiation and radioactive materials on aquatic organisms; the possible utilization of radiation to induce useful gene mutations in plants; on the mechanism of radiation damage to plant physiology and development; on the role of the endocrine glands in the radiation syndrome, and radiation-inducted sterility in dogs.

Studies on the effects of all kinds of radiation on cell behavior, cell chemistry, and on the nuclei and chromosomes of cells in a range of living organisms of increasing size and organization, extending from the viruses to the common laboratory animals; the energy exchange mechanisms of green plants; plant genetics and cytogenetics; effects of radiation on components of plant and animal tissues; the induction of mutations in mice by a wide range of total levels of acute and chronic radiation exposure; the rates of spontaneous and radiation-induced mutations in the fruitfly; and on the effect of very low dosages of irradiation on the mutation rate in microorganisms.

The major change in this program is an expected increase in mouse genetics research to include studies of the mutation rate of specific genes at lower levels of radiation, 75 and 150 roentgens total dose.

(c) Biophysics research: Fiscal year 1956, $251,000; fiscal year 1957, $255,000.—This category of basic radiobiology research will continue at essentially the same level in fiscal year 1957. However, as new research equipment becomes available more emphasis will be placed on research in this area in the future.

The adoption of techniques and ideas that have been developed and found useful in the physical sciences to the medical sciences will be continued. Cyclotron produced high energy heavy particles (e. g. carbon, helium ions) will enable studies not heretofore possible on the effect of high specific ionization on certain vital organs and tissue components. Research effort here will include studies of effects of alpha particle radiation on luminous bacteria and the phototaxic effect on purple bacteria.

2. Combating radiation detrimental effects, $2,053,000

The objectives of research projects in this category are to find protective and corrective measures which may be used with man and his economically important animals to prevent, minimize, alleviate, and compensate for the harmful effects of radiation in living organisms.

These objectives are approached by testing wide variety of chemical compounds with special biological properties as preventatives against the harmful effects of radiation. Results with micro-organisms have been sufficiently encour-

aging to indicate that such studies should be pursued on a small mammal, such as the mouse.

(a) Medical research: fiscal year 1956, $883,000; fiscal year 1957, $902,000.—Medical research in this area in fiscal year 1957 will include:

(1) Intensified work on promising leads which suggest the presence of a protective factor in the blood issuing from the normal spleen. Further efforts will be made to determine whether the protective effects of normal bone marrow against radiation is due to whole marrow cells or isolatable chemicals therein:

(2) Particular emphasis devoted to promising studies on the isolation, fractionation, and preservation of blood platelets and their use in combating radiation hemorrhage. Further studies will be made on the detailed mechanisms concerned with the metabolism and deposition of isotopes important in atomic energy operations, with special emphasis on the continued search for more agents and methods for accelerating excretion from the body in the event of accidental exposure.

(b) Biological research: Fiscal year 1956, $773,000; fiscal year 1957, $883,000.—Biological research on combative measures will include:

Studies on: Methods of direct reversal of radiation effects by treatment with extracts from nonirradiated tissue in micro-organisms and in mammals; methods of treating specific aspects of the radiation syndrome by use of antibiotics and by removal of radioactive elements by chelating agents; the toxic properties of serum from irradiated animals.

Studies on: Factors which protect bacteria from the harmful effects of radiation by means of chemicals; the separation of cell components concerned in radiation resistance; and the mechanisms by which ionizing radiation results in cellular and molecular damage.

The principal change in this program is an expected increase to explore on a large scale methods of chemical protection against radiation in mammals.

(c) Biophysics research: Fiscal year 1956, $259,000; fiscal year 1957, $268,000.—Combating detrimental effects of radiation includes all costs for theoretical and practical studies to evaluate the degree of protection afforded by various shielding designs and materials. Emphasis is placed on projects aimed at the development of the optimum shield that, while not overdesigned, will provide adequate protection under all operating conditions for which the radiation source is designed. Studies on the attenuation of both primary and secondary scattered radiations by air, water, soil, and concrete are included in this category. Of particular interest are projects that improve our understanding of the shielding required in the high intensity teletherapy machines, X-ray generators, reactors, and particle accelerators used for medical research and therapy. Program degree of activity will be maintained at approximately the fiscal year 1956 level.

3. Beneficial applications of atomic energy, $10,172,000

The byproducts of atomic energy activities have many actual and prospective beneficial applications. The Commission is especially interested in this phase of the biology and medicine program because of the opportunities to exploit the peacetime uses of atomic energy for the benefit of mankind.

(a) Cancer research: Fiscal year 1956, $2,906,000; fiscal year 1957, $3,088,000.—Cancer research studies will continue in fiscal year 1957, utilizing radioisotopes to trace the metabolism of cancer cells in order to understand how they differ from normal tissue. There will be a continuing use of radioactive metabolic products to study hormone metabolism and the mechanism of anemia in cancer patients. More emphasis will be devoted to the problem of how cancer cells become resistant to the effects of radiation and possible methods for minimizing this undesirable resistance. In the field of diagnosis, the search will be continued for new cancer-localizing radioactive compounds whose radiations can be detected from the body surfaces as well as refinement and expansion of techniques already discovered for detecting cancers of the eye, brain, and thyroid. In the treatment of cancer with radiation, research in fiscal year 1957 will include:

(*a*) further exploration of the advantages of high energy particle accelerators, 70 million electron volt X-rays and high-energy gamma rays for treatment of deep-seated cancers;

(*b*) further development of surgical techniques for local placement of isotopes into abdominal and brain cancers;

(*c*) further use of neutron capture by boron compounds in brain tumors, with emphasis on the exploration of higher neutron energy levels and the

possible use of other neutron capturing materials. Techniques will be investigated for minimizing skin burns resulting from this type of treatment;

(*d*) increasing efforts to improve the localization of radioactive isotopes in tumors by combining them with suitable antibodies against cancer tissue.

(*b*) *Medical research: fiscal year 1956, $3,237,000; fiscal year 1957, $3,473,000.*—Radioactive tracer work comprises a substantial part of this effort. Encouraging progress in developing the use of isotopes in both diagnosis and functional understanding of disease states has resulted in an expansion of this phase, with greater emphasis in fiscal year 1957 on the further evaluation of short-lived isotopes. Isotopic methods of analysis continue to contribute valuable information toward an understanding of bodily disturbances resulting from disease; hitherto, much of this knowledge has been largely speculative. Commission interest in developing the use of isotopes in diagnosis and characterization of such diseased states as the anemias, also vascular, kidney, and liver disturbances, as well as endocrine disorders, continues.

(*c*) *Biological research: fiscal year 1956, $2,646,000; fiscal year 1957, $2,794,000.*—The objectives of biological research in this category are:

1. To understand life processes including the movement and role of ions in the food cycle, plant and animal tissues.

2. To make unique uses of radioisotopes in the solution of problems in plant and animal diseases, metabolism of essential and toxic elements in living organisms and the application of new concepts to the benefit of mankind.

These objectives are approached by the use of radioisotopes as tracers and sources of radiation to elucidate biological phenomena, movement of ions in soil, water; metabolic processes in marine and terrestrial organisms; the use of radiation in producing desirable genetic effects; and the nature and control of disease in plants and animals.

The biological research effort in this category will include:

Studies on the use of radioactive isotopes in tracing normal and abnormal physiological and biochemical mechanisms; the biosynthesis of labeled plant products; the use of radiation and radioactive isotopes for applications in plant physiology and agriculture; the metabolism of fission products in farm animals; the mechanism of calcium exchange and of milk secretion in animals; and on reproductive physiology.

Studies on the movement of fission products in soils and plants; the absorption and deposition by animals of fission products from plants grown in contaminated soil; radio-ecology sampling and analysis of radioisotopes in the vicinity of the Nevada test site; the use of radioisotope tracers in plant biochemistry and photosynthesis, human and animal metabolism, and blood formation; the effects of ingestion or inhalation of radioisotopes; the effects of vitamin deficiencies; and on drug metabolism.

(*d*) *Biophysics research: Fiscal year 1956, $22,000; fiscal year 1957, $17,000.*—The biophysical research effort in this category includes research with radioisotopes for determining bacteria in water, and kinetic and mass spectrometric studies of biophysical systems with isotopes.

(*e*) *Distribution of radioisotopes under research support program: Fiscal year 1956, $800,000; fiscal year 1957, $800,000.—To encourage and stimulate the* use of radioisotopes in life sciences research, a program was initiated in fiscal year 1956 which provides for the furnishing of radiosotopes at 20 percent of established price for all such radiosotopes used in medical, biological, and agricultural research including research in medical therapy and diagnosis.

4. Biomedical problems in atomic-energy operations, $5,809,000

The special interest of the Commission in research in this category arises from the fact that the testing of atomic fuels, the operation of reactors, and the detonation of experimental atomic and nuclear weapons create such problems as the toxicology of new substances, the release of radioactive fission products into the atmosphere, and the production of large quantities of radioactive waste materials for which adequate methods of disposal must be devised.

(*a*) *Medical research: Fiscal year 1956, $734,000; fiscal year 1957, $1,094,000.*—Of the two types of medical problems in atomic energy operation unrelated to radioactive materials, the following areas will be stressed in fiscal year 1957:

(1) Blast effects from nuclear detonations will be studied in greater detail by characterizing the relative importance of various physical factors as well as the mechanism and possible prevention of injury.

(2) Studies of the toxicity of nonradioactive materials will emphasize research on various solvents used in both chemical production and reactor

technology as well as further study, particularly at the University of Rochester, of the hazards from lithium, fluoride, beryllium, and uranium.

Specific projects developed in relation to the test programs involving research on physical and biological damage, radiation, blast and thermal instrumentation, and the effects of nuclear explosions materials and combinations of materials are also included under this activity.

(*b*) *Biological research: Fiscal year 1956, $1,716,000; fiscal year 1957, $1,886,000.*—The objectives of biological research in this category are:

(1) To discover everything possible about the biological effects of fission products, and

(2) To measure the extent of environmental contamination from fallout and from reactor effluents, and the extent of the uptake of the contaminating radioactive materials in plants and animals, terrestrial and aquatic.

The objectives are approached by detailed studies of the reactions of plants and animals subjected to actual and to simulated fallout and reactor effluents.

The biological research effort in this category will include:

Studies on the toxicity and biological effects of pile effluents on aquatic organisms, microorganisms, mammals and plants of economic importance; suitable biological materails to assist in estimating permissible human exposures to radioactivity; the underlying biological, biophysical, and biochemical phenomena which are involved in the effects of radiotoxicological materials on human beings; the relative biological effectiveness of radiation of different types and different energies on mammalian biological systems using weapons tests and critical assemblies such as "Godiva," and the cycle of radioactive materials from air to soil to plants to animals to man.

Services and supplies are provided for various Commission-sponsored research projects on the ecological effects of radioactivity in the Marshall Islands.

(*c*) *Biophysics research: Fiscal year 1956, $2,680,000; fiscal year 1957, $2,829,000.*—The problem of health hazards associated with the handling of radioactive materials is a serious matter that continually confronts the Commission, related to both useful products and wastes that have to be discarded.

Continued field experiments designed to study the dispersion and transport of stack effluents will yield additional information on airborne content and ground concentrations of these effluents. Installations of automatic telemetering networks for monitoring of radioactivity over larger areas from a central control station have been completed in several Commission laboratories.

The problems of waste disposal are under active consideration. In the matter of ground disposal, recent findings have cast serious doubts on previously developed disposal criteria to the extent that the new data must be confirmed or denied on an urgent basis. Disposal at sea is regarded as a promising method for the future and increase in research effort is needed to determine suitable ocean sites and procedure for disposal.

Determination of the location of radioactive fallout from our weapons test operations will involve a telemetering network, supervision of mobile monitoring teams, and extensive analysis of data collected.

The development of more accurate values for the permissible levels of radioisotopes in food, air, and water, will continue. More data are needed on chronic toxicity of radioisotopes in mammals. Much of our present available data is from accidental contamination by humans and from animal experiments performed in other countries. Some expansion of the chronic toxicity program is anticipated.

5. Dosimetry and instrumentation, $2,365,000

The entire biomedical research program is concerned primarily with the effects of ionizing radiation on living matter. These biological effects must be correlated with the physical measurements of radiation dose (dosimetry) which is determined by instrumentation. The dosimetry and instrumentation activities of this program are concerned with the design and development of measuring techniques and instrumentation for support of the Commission's biological and medical research program. The increases in fiscal year 1957 are due primarily to increased emphasis in instrumentation for high energy radiation dose measurements, for more sensitive radiation instrumentation, and for research and development on primary radiation sensing devices.

The purpose of this program is to provide for the measurement of radiation dose from ionizing radiation such as neutrons, gamma rays, beta particles, etc., emanating from high energy accelerators, reactors, atomic weapons, and radioisotopes. These dose measurements are necessary for biological studies on radia-

tion effects, for studies in shielding, for shelter design, and for radiation protection. The budget estimates for the dosimetry and instrumentation activities are as follows:

(*a*) *Dosimetry: Fiscal year 1956, $1,101,000; fiscal year 1957, $1,186,000.*—

(*b*) *Instrumentation: Fiscal year 1956, $994,000; fiscal year 1957, $1,179,000.*—

6. Vocational and special training, $570,000

(*a*) *Vocational training program: Fiscal year 1956, $253,000; fiscal year 1957, $314,000.*—This program provides for training of individuals in health physics and industrial hygiene and medicine with special emphasis on radiation and unusual toxic hazards. Trained personnel in these fields are urgently needed by the Commission, private industry, and other organizations utilizing radioisotopes and other sources of radiation. The planned program is tabulated below:

	Fiscal year 1956		Fiscal year 1957	
	Number	Amount	Number	Amount
Radiological physics	59	$161,000	80	$218,000
Industrial hygiene	7	33,000	8	36,000
Industrial medicine	8	59,000	8	60,000
Total	74	253,000	96	314,000

(*b*) *Special training program: Fiscal year 1956, $221,000; fiscal year 1957, $256,000.*—Training courses in specialized subjects are conducted at Commission laboratories and include:

(1) Brookhaven National Laboratory: Summer training period for AEC radiological physics fellows, as well as information sessions, demonstrations, and short courses in radiological physics and civilian defense needs.

(2) University of Rochester: Graduate training for 65 students includes radiological physics, pharmacology and toxicology, etc.

(3) Oak Ridge National Laboratory: Provides for field training of radiological physics fellows, 6-week training program for military medical officers, and special group training in health physics.

(4) Oak Ridge Institute of Nuclear Studies: Specializes in training courses in radioisotope techniques, and sponsors graduate studies and research participation programs.

(5) University of California Radiation Laboratory: It is planned that this installation will initiate a program in health physics associated with high-energy accelerators.

7. Equipment not included in construction projects, $1,072,000

This category provides for replacement and additional equipment required for the biomedical research program.

The cost of equipment in 1957 is expected to decrease from the 1956 level of $1,217,000 to $1,072,000, due chiefly to the fact that nonrecurring unusual costs were incurred in 1956 for major equipment for the accelerator at the Argonne Cancer Research Hospital. A distribution of the estimated 1957 costs between replacement and additional equipment is shown, by office, in the following table:

Office	Replacement	Additional
Chicago	$69,000	$60,000
Hanford	19,000	98,000
New York	123,500	76,500
Oak Ridge	147,000	98,000
San Francisco	9,935	113,065
Schenectady	6,500	1,500
Washington		250,000
Total	374,935	697,065

Seventy percent of the total estimate comprises laboratory and shop equipment. The remaining 30 percent is for other categories of equipment required under this program such as hospital and medical, motor vehicles, and security and protection equipment.

The estimate provides for replacement of equipment which is worn out, damaged beyond repair, obsolete, or no longer economically usable. The additional equipment, consisting primarily of laboratory equipment, is required for an expanding program and to keep pace with scientific advances.

Mr. CANNON. I would be glad, General Fields, if you would give us a statement as to the progress being made in this program.

Mr. FIELDS. For this program, my statement would be that radiation is one of the distinguishing characteristics of the atomic-energy program and that excessive amounts of radiation can produce damage to living cells. Conversely, controlled radiation in the hands of skilled physicians and scientists can produce extremely beneficial results. Therefore, the Commission is interested in both the harmful effects of radiation and in its beneficial uses.

GENETIC EFFECTS OF RADIATION

Our research program in biology and medicine is therefore developed along these lines. Now, as to the high points in the budget, the main program is on radiation effects on biological systems. This reflects our interest in the effects of high-level radiation and the effects of repeated doses of low levels of radiation. For example, at the Atomic Bomb Casualty Commission in Japan, we have under study the only large human population ever exposed to radiation, namely, the Japanese at Hiroshima and Nagasaki.

Mr. PHILLIPS. What do you mean by a separate commission?

Mr. FIELDS. It is a group located in Japan called the Atomic Bomb Casualty Commission.

Mr. PHILLIPS. Is it an internal group?

Mr. FIELDS. It is an internal group with us. Actually it is operated by the National Academy of Sciences. It has personnel located there to study the population.

Mr. PHILLIPS. In Japan?

Mr. FIELDS. In Japan, yes, sir. We also want to look at the effects of low-level irradiation in order to keep pace with the expanding industrial power program. We need to know more about the immediate effects of repeated doses of low-level radiation. We have pretty good information on the effects when they get up to the 300- to 600-roentgen levels of exposure, which are extremely high. This would be exposures which might be fatal. We know this as a result of studies which have been carried on in the past with animals. We think we know a great deal in this area. But we do need to study the effects of lower levels of exposure, and here one of the most important questions is that of long-range genetic effects.

It has very broad implications as we have discussed here previously. In these studies, therefore, we intend to expand, in experimenting with animals, such as the fruitfly, and mice, rather than with man himself. We hope that through these means we will develop considerably more knowledge in this area.

Mr. CANNON. General Fields, you have had a more comprehensive laboratory at Hiroshima and Nagasaki, and you have had 10 years in which to work on material which could be securied nowhere else. Surely within these 10 years you have been able to reach some definite generalizations as to the genetic effects?

Mr. FIELDS. Well, sir, the problem with the human race, is that you must look at generation after generation on genetic problems and in

Japan you have had only the beginning of the first generation after the population which was exposed at Hiroshima. Just looking at the first generation is not enough in these genetic studies. As Dr. Dunham reported the day before yesterday, from information available at this point, there is no statistically reliable indication as to the effects of the exposure to the population in Japan, as of the moment.

Mr. CANNON. The newspaper accounts which have come to us—and the general public, of course, is dependent upon newspaper accounts rather than on scientific data—the newspaper accounts indicate that after 10 years there is no evidence of any kind whatever of any genetic effect upon those exposed to radiation in Japan in 1945. Is that conclusion correct?

Mr. FIELDS. Perhaps I should ask Dr. Dunham to speak on this. I believe the point was that the statistical base, that is, the numbers you had to deal with in working on this problem were not sufficient to say that there were no genetic effects or to say that there were.

Mr. CANNON. At least, Doctor, you cannot say that there were any definite recorded genetic effects?

Dr. DUNHAM. That is correct.

Mr. CANNON. And how many people were involved in your study?

Dr. DUNHAM. We studied 40,000 offspring but only 2,000 of those offspring were of patients who had received fairly high doses of radiation.

Mr. CANNON. Out of those affected, you naturally selected extreme cases, 2,000 of the most extreme cases. If it affected anybody, it affected those 2,000.

Dr. DUNHAM. That is right.

Mr. CANNON. So far as you were able to determine you could not say definitely it had any deleterious effect on procreation.

Dr. DUNHAM. That is correct, but to say the converse that there were not any, and to be able to stick with it, it would take the type of research we are doing at Oak Ridge where we now have 250,000 mice and their offspring, to get enough statistical data to say definitely whether there was not an effect or there clearly was an effect.

Mr. CANNON. Up to this time have you sufficient data to report as to the effect upon mice or other labortaory material?

Dr. DUNHAM. We have information on mice whose parents have been exposed, to 600 roentgens as a single dose and to 300 roentgens as a single dose. One part of the increase in this budget is an additional amount to study the offspring of mice who have been exposed to somewhere between 100 and 175 roentgens.

Mr. CANNON. How many generations?

Dr. DUNHAM. This particular type of study about which I am talking is a matter of checking the first generation. But that is then only the beginning, as it were.

Mr. CANNON. Would it be your conclusion, Doctor, as a general impression, that if there is any deleterious effect upon regeneration, that it would be discernible in the first generation?

Dr. DUNHAM. Certain of the mutations are discernible and if you have enough animals, such as these huge numbers at Oak Ridge, you can demonstrate it and prove it statistically. There is no question about it.

Mr. FIELDS. That is true for very high levels of radiation.

Dr. DUNHAM. You could do it even at lower levels if you went up to millions of mice, but I think that goes beyond the point of practicability.

Mr. PHILLIPS. What is the fatal dosage?

Dr. DUNHAM. A single acute dose probably takes about 400 roentgens.

Mr. PHILLIPS. You give them 600.

Dr. DUNHAM. One group got 600 and the other group got 300 roentgens.

Mr. PHILLIPS. What would be a deadly dosage?

Dr. DUNHAM. At 450 roentgens, 50 percent of them—that is humans, not mice, would have died. With 600 roentgens in the strain of mice they are using at Oak Ridge very few would have died.

Mr. PHILLIPS. Did you expect mutations or did you expect sterility?

Dr. DUNHAM. This is concerned entirely with mutations. One would expect temporary sterility at much lower doses.

Mr. PHILLIPS. Were your studies devoted entirely to physical traits or also to psychological traits?

Dr. DUNHAM. There were no psychological studies done on these mice. They were things that had been selected by Dr. Russell and his group, such as change in certain hair color, shape of an ear, or somethink like that, which could be easily defined.

Mr. PHILLIPS. Out of your mice that the chairman is asking about, how many actual mutations did you find?

Dr. DUNHAM. There were 7 loci which they were studying and looking for. There may have been other mutations in internal organs or which would show up in succeeding generations.

Mr. PHILLIPS. I will ask that next. If you had not treated them with the radiation, how many mutations or abnormalities would you expect to find?

Dr. DUNHAM. You would get the same seven, but at much different rate.

Mr. PHILLIPS. That is my point. I don't think you have found anything yet.

Dr. DUNHAM. We have found with the control mice the rate of mutation is a given figure. I don't recall the exact figure. But based on experiments 600 roentgens, and with 300 roentgens, it suggests that it would take somewhere between 50 and 60 roentgens to double the control rate.

Mr. PHILLIPS. How come your investigations in Japan itself—now, you have nothing—first of all you have only had 10 years.

Dr. DUNHAM. That is correct.

Mr. PHILLIPS. You don't have a single child who is probably more than 10 and your average would be about 4 or 5 years.

Dr. DUNHAM. That is correct.

Mr. PHILLIPS. All you have is the hybrid generation. You don't have a generation that will show the mutations.

Dr. DUNHAM. It will not show those mutations which will show up at a later time.

Mr. PHILLIPS. I think that ought to be made clear on the record. This is not just academic discussion with me, but when this record goes out of here, it will be read by a lot of people. It will be read by the newspapers and they are going to write stories on it on the basis of some profound scientific knowledge which seems to be inherent in the

Washington newspapers. They are going to point out that there were no abnormalities, there were no mutations, there were no psychological factors involved when as a matter of fact you haven't the slightest idea, because you are dealing with what we call the hybrid generation, rather than the first generation that would show them. Second, you only have had 5 years, and third, you did not take into consideration any of the psychological effects which are more apt to show the changes, the mutations and abnormalities than the physical characteristics.

Dr. DUNHAM. But they are at least measurable. That is the problem.

Mr. CANNON. The fact is that you have made no psychological studies, you have collected no data on mental aberrations?

Dr. DUNHAM. We have data on that, but not in these genetic studies.

Mr. CANNON. The fact that you have not made specific studies in the field would indicate that you have observed no need for it.

Dr. DUNHAM. That is correct. These other ones are the easiest to identify, and in a project of this size you have to stick with the things you can be sure of.

Mr. CANNON. Mr. Rabaut.

Mr. RABAUT. Is it a question of the ease of the different studies?

Dr. DUNHAM. It is a question of what is practical. I will put it that way. One of the limiting problems in studying human genetics is that it is probably the least well known field of genetics, simply because the human being does not behave like an experimental animal, and you can't breed him like an experimental animal so that you can get a desired result.

Mr. PHILLIPS. Not unless we have a police state.

Mr. RABAUT. I think we have enough on the record. Now, have you anything that you want to tell us that should not be on the record?

Mr. DUNHAM. No, there is nothing in this area that is classified in any way.

Mr. CANNON. You may resume, General Fields.

CANCER RESEARCH

Mr. FIELDS. Well, sir, another main part of our program in biology and medicine is in the field of the beneficial applications of atomic energy. Our cancer research program, which we discussed briefly the day before yesterday, is a typical example. We have a special and direct interest in this, as it is one of the most important late effects of overexposure to radiation. We are exploring the use of nuclear radiation from atomic piles. At the Brookhaven National Laboratory, the medical department is studying the use of neutrons from the reactor to treat advanced brain tumors in terminal patients. While no cure is yet evidenced, this approach does offer promise.

Now a special reactor designed specifically for medical use at this medical research center is to be built next year with funds provided in fiscal year 1956. This should be a very interesting and productive program and one in which we have a great interest, and I believe the entire country does.

At the radiation laboratory at the University of California at Berkeley, scientists are using a 184-inch cyclotron, one of the accelerator machines, in an experiment to control the growth of cancer. They are proceeding on the basis of certain types of malignancy depend on pituitary hormones for the growth. It has been found that a proton beam from this cyclotron can be used to destroy the pituitary gland and thus the supply of hormones is reduced and the growth of cancer is retarded. This program is still in the experimental stage, but it is another sort of research for the beneficial uses of radiation that is supported in this budget.

Mr. CANNON. Your results secured so far warrant your continued study?

Mr. FIELDS. We think very definitely so, sir. I believe the total in this budget is $3 million for cancer research efforts. Is that not true?

Dr. DUNHAM. Yes.

USE OF ISOTOPES IN AGRICULTURE

Mr. FIELDS. Now, as to other beneficial uses which are being explored through plant experiments. By plants I don't mean our facilities, but actual growing plants. We have exposed oat seeds to neutron beams from a pile, and have produced a strain more resistant to the costly oat blight which annually produces large damage in many oat crops.

This assumes full significance when you consider that oats are the third largest cereal food crop in this country.

Result of other experiments in this field are the development of new strains which have stronger straw, wider leaves, and more dense spikes. In other words, a hardier and more productive plant. This may have considerable practical commercial importance.

Mr. CANNON. Off the record.

(Discussion off the record.)

Mr. FIELDS. Another example has to do with extending the storage life of potatoes. We have exposed potatoes to gamma rays and have learned that radiation will extend the storage life of potatoes by many months. The same thing has been found with regard to other root vegetables such as the onion.

Mr. CANNON. Without deterioration in their nutritive value?

Mr. FIELDS. Yes, sir. There are innumerable examples of this. In 1952, Brookhaven National Laboratory began a cooperative program with universities and agricultural experiment stations. That laboratory would irradiate crop plants and fruit trees with gamma rays from these machines, and then return the plants to the institutions for growing and observation. There have been many interesting mutations in plants as a result of these experiments. There are 75 cooperating institutions in this program at the present time. Similar arrangements have been recently made with the University of Tennessee farm project. There is a great deal of effort in the application of irradiation to plants, and the effects on plants is perhaps one of the most interesting. We have one Commission member who feels that the benefits from uses of this sort will be as great as in any other field in the atomic energy program. I think most of us are inclined to agree with him. There is a great deal of benefit to be obtained from this type of studies.

DISPOSAL OF ATOMIC WASTE

Some of the problems dealt with in this program have to do with the question of waste disposal; that is, waste products from atomic-energy projects, including reactor projects and others. We have studies which look toward the methods of disposal, either on land or in the sea. It is a complicated problem, and does take a lot of research and development as to the effects of such waste. We cannot dispose of these materials, for instance, where they may get into the water supply of a community. Similarly, we cannot use sea burial indiscriminately. It may affect life in the sea. This is a project which will be of long duration. I believe it is indicated in the National Academy of Sciences report that this is one of the problems for the future in connection with the development of a large-scale atomic-energy program in various countries. It will take very good measures to properly care for these wastes.

There is no reason to believe, however, with the appropriate systems and controls, that it cannot be done.

RADIOACTIVE FALLOUT

Additionally, the biology and medicine program is concerned with the problem of radioactive fallout. They have been directly associated with many of the atomic tests which have been held. In this area they have done a great deal of research and development, and also actual operational work in conjunction with the tests. This has to do with the detection and tracing of fallout, its effects, and means and measures for protection. We are looking particularly at the effects of strontium and studies on this have been underway for a long time, both as to what may occur from the tests, and the effect of strontium when introduced into the human system. These are the types of studies that are carried out in the biology and medicine program.

Additionally, we conduct certain special training courses in the radiological physics, and in industrial medicine and industrial hygiene. Perhaps I should ask Dr. Dunham if he wishes to elaborate on this general statement in any way before we proceed.

INCREASE IN THE BIOLOGY AND MEDICINE BUDGET

Mr. CANNON. Before we go to Dr. Dunham, this apparently is an instance in which you have availed yourself of the authorization to transfer funds from program to program. I note, for example, here on page 106, that you estimated you will spend for the fiscal year 1956, $29,172,000, whereas last year you estimated you would need $27 million.

You spent last year $29 million; you estimate this year you need $31 million, an increase of $2,355,000 over your revised estimate.

Mr. FIELDS. Yes, sir; and this is to increase the level of effort on certain programs such as radiation effects and the genetic studies which Dr. Dunham referred to, and for other activities of this nature.

Mr. CANNON. For 1956 you estimated $27 million, and for 1955 you estimated $27 million. But this year you are asking a $4,527,000 increase. Is that due to increased emphasis placed on this item? It is not due to an increase in objectives for which it is being used?

Mr. FIELDS. It is for increased emphasis on the program of biology and medicine and for the acceleration of some of the projects under that program, such as the genetics studies and studies with respect to strontium. It is for increased effort in these fields. It is not for new programs or projects being introduced into the program.

Mr. CANNON. And the results secured seems to justify additional expenditure for this coming year?

Mr. FIELDS. Yes, sir; they definitely justify it.

Mr. CANNON. Dr. Dunham?

Dr. DUNHAM. I will be glad to discuss any part of the program you would care to have me discuss, Mr. Cannon.

Mr. CANNON. Can you give us a general statement. This is one of the interesting items in the program. We would like to have a general statement, if you will, Doctor.

EFFECTS OF RADIATION ON HUMANS

Dr. DUNHAM. I might talk first about this matter of the problem of radiation effects. We are not only concerned with genetic effects, but we also have a great deal of interest as to the long-term effect on human beings who might be exposed to very small amounts of radiation at any one time, but which aggregate to a fairly sizable total. These effects are referred to primarily as the effect on the life span of an individual.

Mr. CANNON. You mean the life expectancy?

Dr. DUNHAM. That is correct. We know that in experimental animals a large single dose of radiation will curtail the life span of the animal. The animal does not die of a different condition than he would have died of otherwise, but he dies earlier.

Mr. CANNON. You think then that in the case of human beings exposed to radiation, the exposure to radiation would decrease life expectancy?

Dr. DUNHAM. A large single exposure definitely would.

Mr. CANNON. One exposure would be sufficient to incur that effect?

Dr. DUNHAM. Yes; one large single exposure. We are looking for that effect now among the Japanese.

Mr. CANNON. Would it merely reduce the life expectancy of the individual or would it also reduce the life expectancy of descendants of that individual?

Dr. DUNHAM. The other side of the coin is the genetic effect on his offspring which we were talking about a little earlier. The question now is, if people are exposed to only a small amount every day or every week or something like that, is the summation of these exposures the same in its effect on the life span as one would expect from a single large exposure.

Mr. CANNON. The public generally has been led to believe that this new reaction would increase the life span rather than decrease it, and would control diseases which reduce the general average of human life. It is something in the nature of a surprise when you say that instead of increasing the probability of avoiding disease, it increases the hazard and lowers the average life expectancy.

Dr. DUNHAM. The effect which I referred to is in the case of large single exposures, such as might happen in time of atomic warfare.

Mr. CANNON. You think it would not affect generally the human race or the population of any particular geographical area. It would be limited only to those individuals who were subjected to continued or intense radiation?

Dr. DUNHAM. As far as large exposures go, yes. I think with proper control to see that the exposures of the population as a whole are kept minimal, as they have been in the past, there need not be expected any significant effect on life span.

RESULTS OF CANCER RESEARCH

Mr. CANNON. Doctor, we are spending an increasing amount of money every year for the control of major diseases. One of them is cancer. For the last 3 or 4 years we have increased expenditures for the control of cancer and heart disease. Still we are told that up to this time nothing has been discovered or developed which will tell us anything about the origin or which will contribute in any degree to the control of these diseases. Apparently the money we have spent up to this time has been without results, unless, as has been indicated here by General Fields, it may be that you have discovered some method of destroying internal cancer.

Did I understand you to indicate you now believe that radiation can be used in controlling cancer once it has been contacted?

Mr. FIELDS. My statement is to the effect that there are possibilities. That is why we are proceeding with the work at Brookhaven National Laboratory.

Mr. CANNON. It is nothing more than a possibility?

Mr. FIELDS. Perhaps Dr. Dunham can speak to that.

Dr. DUNHAM. I would say first that during the past 50 years and particularly the past 10 years a great deal has been learned about the control of cancer and the treatment.

Mr. CANNON. We are told the only method developed up to this time relates to early detection of cancer in its incipiency when it can be controlled by surgery.

Dr. DUNHAM. Or by radiation.

Mr. CANNON. Give us the benefit of your studies in that field.

Dr. DUNHAM. Let me take up the matter of treatment first. Radiation has been used for a number of years to treat cancer. Probably the very first medical use of atomic energy, other than using X-rays to diagnose or look inside of the chest, was to treat cancer. Many, many skin cancers have been cured with radiation and also some internal cancer.

Mr. CANNON. That is a statement to which the medical profession will agree?

Dr. DUNHAM. I believe so, sir.

Mr. CANNON. That skin cancer can be and has been cured by radiation?

Dr. DUNHAM. That is right; they can also be cured by surgery.

Mr. CANNON. Does that apply to skin cancer only, or does that apply to other forms of the disease?

Dr. DUNHAM. The best results are with skin cancer for the very reason you pointed out. That is, the sooner one can diagnose the cancer, the more satisfactory the treatment, the more likely of developing a

cure. The skin cancers being on the surface, the individual notices them and they go to their doctor and get appropriate treatment.

Now, as to the cause of cancer, there is a great deal of work that has been accomplished in that area, too. We still don't know the cause of any specific cancer. It is my own personal feeling that different cancers may have different causes. We are learning, both in our program and in the much larger programs of the Cancer Society and the National Cancer Institute, a great deal about the chemistry of cancer cells and how they differ from those of normal cells. This is the first step in finding out how you can block that cell growth. The large program of the Public Health Service on the chemotherapy of cancer is approaching the problem in very much the same way as in the use of antibiotics to control infection. The antibiotics act, in many instances, by just blocking which the bacteria, certain steps in the bacteria's metabolism, and some of these new chemotherapy agents now being tested act just the same way.

There is another aspect of cancer, and that is, is or is not the beginning of a cancer in the body, whether it be a man or an animal, the result of a mutation which gets us back to genetics again.

Mr. CANNON. We have demonstrated that cancer is not hereditary?

Dr. DUNHAM. I would say not, sir.

Mr. CANNON. You do think that it is hereditary?

Dr. DUNHAM. The evidence points in the direction of there being a hereditary factor. There are also other factors to be considered, environmental factors, whether it be radioactivity, whether it be cigarette smoking and whatnot. That is what makes the problem so complicated.

Mr. CANNON. We are told that tuberculosis is not hereditary, but that the children of tubercular parents are apt to contract it through acquisition from their parents. Not because of heredity, but because of proximity.

Dr. DUNHAM. Yes.

Mr. CANNON. Would you say that is true of cancer?

Dr. DUNHAM. No; cancer is not contagious. You don't get it from exposure to an individual with cancer.

Mr. CANNON. Will you proceed, Doctor, and tell us what is your objective, and what is being accomplished with this money for the control of disease?

Mr. PHILLIPS. While the chairman is looking at something else, do you actually mean to put on this record that cancer is hereditary, or that a patient in the same family may have a diathesis or susceptibility to the same disease that the parent has?

Dr. DUNHAM. It amounts to the same thing. It is a hereditary tendency, shall we say. But this is not as clear cut, for instance, as it is for some other disease, and it is probably not the controlling factor in many cases.

Mr. CANNON. This is the sum and substance of the whole matter. Do you think that the vast expenditures which the Government is making, both in this program and in the HEW program especially, have increased our knowledge of the origin and control of cancer?

Dr. DUNHAM. Yes, sir, very definitely. There is no question about it.

Mr. CANNON. Are we able at this time to control cancer through results of laboratory technique?

Dr. DUNHAM. No, it still is a very serious problem.

Mr. CANNON. It is not a practical knowledge, that would be of any individual advantage. What we want is knowledge that would save future generations from cancer. You say you have increased your knowledge of it, but you have not been able to save a single patient.

Dr. DUNHAM. I would not say we have not saved a single patient. I would say a good many patients have been saved.

Mr. CANNON. By benefit of surgery.

Dr. DUNHAM. No. It is hard to say in some instances whether you have actually saved their lives, but there have been many instances where the life has been prolonged far beyond what would have been expected with the more conventional method. I mean a comfortable, active life.

Mr. CANNON. I wish you could include in your testimony now when it comes to you the names of specific instances in which we have saved without surgery those undoubtedly infected with cancer.

Dr. DUNHAM. I will be glad to put something to that effect in the record.

(The information requested is as follows:)

CONTRIBUTION OF NUCLEAR ENERGY SOURCES TO THE TREATMENT OF CANCER

The first uses of artificially produced radioactive isotopes in cancer began about 20 years ago on a small scale with the development of the cyclotron. The major impetus, however, followed the development of nuclear reactors when isotopes became available on a large scale. The shipments of radioactive isotopes from Oak Ridge National Laboratory have increased from less than 500 in 1946 to over 12,000 a year within the last few years. About 25 percent of the dollar value of all isotopes produced at Oak Ridge are used for cancer therapy. In general, there are three facets to the uses of isotopes in cancer: Therapy, diagnosis, and research. The following are some of the types of application of isotopes to the treatment of cancer and with results to date:

Radiophosphorus has been used in the treatment of a form of blood cancer known as polycythemia vera with highly successful results. Experience accummulated in several hundred patients indicates that the median survival of such cases after treatment is 14 years.

Chronic leukemia has been treated with P_{32} in thousands of patients and in about half of these life has been prolonged more than 5 years.

Superficial tumors of the eye have been treated very successfully with applicators incorporating radioactive strontium. Other superficial cancers, such as those in the skin, have been effectively treated with radioistopes such as P_{32} with 5-year cure rates as high as 98 percent.

Colloidal radiogold and chromic radiophosphate have been used for direct injection into carcinoma of the prostate. Similarly, cobalt-60 is being used for treatment of tumors of the nasal pharynx, uterus, bladder, prostate, and lung but, in general, an insufficient time has elapsed for comparison with the standard types of treatment.

Colloidal radiogold and radioyttrium are being used extensively for the treatment of persons developing fluid in the lung and abdomen from cancer. This in no sense represents a cure because this condition occurs only in cases with widespread dissemination of cancer but the relief of pain and discomfort afforded the patient is often dramatic. Cobalt-60, sodium-24 and bromine-82 have been used for the treatment of bladder tumors and, although cures are produced in relatively few cases, successful relief of pain and discomfort have been achieved, at least on a temporary basis, where the tumor is confined to the lining of the bladder. Cobalt and cesium isotopes as sources of highly penetrating gamma radiation in the form of a teletherapy bomb are being used in rapidly increasing numbers as a substitute for the more standard variety of X-ray therapy. The results in the treatment of cancer from this application of isotopes are not radically different from that achieved with X-ray therapy but a number of advantages make their use an important addition to the methods of cancer therapy.

Radioiodine, which is widely used in the treatment of hyperthyroidism, has been successful in a few paients in apparently curing thyroid cancer. In general, the uptake of radioiodine by thyroid cancer tissue is not great enough to effect a cure but there is an active research program for the improvement of this selective localization which will certainly improve the effectiveness of this type of treatment.

Diagnostically, radioisotopes have made a significant contribution in the detection of cancer which is a vital preliminary step in the use of any form of therapy. Tumors of the brain, eye, thyroid, and liver have been successfully detected, utilizing an isotope such as I_{131}, P_{32}, As_{74}. For example, in the use of P_{32} for the detection of tumors of the eyeball, an accuracy of 90 percent has been achieved. Similarly, in a study of several hundred cases of possible brain tumors per year, an accuracy of about 70 percent has been achieved with the use of radioarsenic.

The use of radioisotopes for research on cancer is undoubtedly one of the most important applications of atomic energy at the present time. Radioisotopes provide an indispensable tool for the analysis of the chemical behavior of cancer tissue and of the mechanism of action of the various chemical agents which are being used for therapeutic purposes. Under these circumstances, radioisotopes are not directly used for treatment of cancer but they are vitally important nevertheless since advances in this field are dependent on a further elucidation of the metabolic peculiarities of cancer tissue.

A number of very important research studies are in progress at the present time involving the direct utilization of radioisotopes which, although very promising at the present time, are not sufficiently worked out to justify general usage. For example, the use of antibodies against cancer tissue which are tagged with large amounts of radioiodine constitutes a promising approach to the problem of concentrating radiation in deep-seated cancers. At the present time, deposition of such radioactive antibodies in tumors has been 15 times greater than normal tissue. The selective deposition of boron in brain tumors followed by exposure of the head to soft neutrons from the atomic pile has enabled large doses of radiation to be delivered selectively to the brain cancer. Although cures with this form of treatment have not yet been achieved, the technical limitations of the method are rapidly being overcome, and it is hoped that this approach will constitute a useful therapeutic technique.

Breast cancer, which is one of the most common of all tumors, is strongly dependent on hormones for its growth. The utilization of a high energy cyclotron beam or implanted pellets or radioisotope have been used to destroy the pituitary gland in order to modify the hormonal balance and thus slow the growth of this type of cancer. Very promising results have been achieved thus far but further data must be obtained in order to validate the method.

In summary, the uses of radioisotopes, both internally and externally, as well as the application of accelerators and the atomic pile in the treatment of cancer, have given us tremendously important tools in the treatment and understanding of cancer. It is to be anticipated that continued development of the many facets of this field will yield many new new and important advances.

Mr. CANNON. Without objection the committee will stand adjourned until 2 o'clock.

AFTERNOON SESSION

COMBATING RADIATION DETRIMENTAL EFFECTS

Mr. CANNON. General Fields, under "Combating radiation detrimental effects," I note that last year you asked for and you were given, $1,550,000 for medical research. Now you estimate your expenditure will be $883,000.

We strongly approve the economical administration of that item and your request this year for a reduced appropriation. In the same item, under biological research, you asked for $1,441,000, whereas this year the budget estimate is for $883,000.

Was that reduction made with your approval or was it made by the Bureau of the Budget through reduction of estimates which you submitted to them?

Mr. FIELDS. My page indicates an increase in fiscal 1957 over what we had estimated will be spent in fiscal year 1956.

Mr. CANNON. How do you explain that reduction?

Mr. MCCARTHY. I think that was due entirely to reprograming within the biology and medicine program to the various activities.

INCREASE IN ISOTOPE SUBSIDY

Chairman CANNON. What made that programing necessary or advisable?

Mr. MCCARTHY. In total, the biology and medicine program increased by a little over a million dollars. One of the major factors for the increase was due to the new policy on the subsidy of isotopes. At the present time we are providing isotopes for medical research and for agricultural research at a cost of only 20 percent to the user. At the time our budget was discussed last year we were making a charge of 80 percent to the user. Just prior to that time the policy was changed in order to enlarge the use of isotopes.

Mr. CANNON. What made that change advisable and what has been the result of the change?

Mr. MCCARTHY. I think Dr. Dunham can probably talk to the change, in usage.

Dr. DUNHAM. That is an increase which seemed very well warranted because there are a number of institutions who are using isotopes in research who do not have all the funds that it probably would be desirable for them to have for the conduct of research. Some of the results they are getting would not be research particularly appropriate for the Division of Biology and Medicine of the AEC to support. We try to have the work we support bear some real relationship to the mission of the Atomic Energy Commission. The revised policy now enables those institutions to get isotopes essentially at a reduction of 80 percent off the list price for those isotopes which are produced by the Commission, either at the Oak Ridge National Laboratory, Brookhaven, or Argonne.

Mr. CANNON. Has this reprograming been in effect a sufficient length of time to determine whether it was a wise readjustment?

Dr. DUNHAM. The demand suggests it was a very wise thing.

Mr. CANNON. Has the increased dissemination of isotopes and their utilization indicated sufficient additional advantage to warrant this additional expense?

Dr. DUNHAM. We believe so, sir.

Mr. CANNON. What leads you to that conclusion?

Dr. DUNHAM. The way in which they are being used. You see, we know what the people are doing with the isotopes because in order to get this reduced price they are required to state what research they plan to do with the isotope.

In reviewing those research statements of intent, we find that it is all work that, at least in our opinion, is useful in either medical, agricultural, biological, or biophysical research.

Mr. CANNON. You would say that as a result you are a little further along?

Dr. DUNHAM. It is another contribution by the AEC to get institutions working in the field and to familiarize themselves with the techniques of atomic energy.

Mr. CANNON. And the same would apply to this item under "Beneficial application of atomic energy"?

Dr. DUNHAM. Right.

Mr. CANNON. I note in the justifications discussion of the 20-percent increase of radioisotopes that you have apparently reached the conclusion that it is a broadening policy which is worth the price?

Dr. DUNHAM. Very definitely. It makes them available in more places than they would be otherwise.

ESTIMATES FOR RADIATION EQUIPMENT STUDIES

Mr. CANNON. Under "Radiation equipment" and under the subtitle of "Dosimetry and instrumentation" on page 119, on the item of "Radiation equipment," as we termed it last year, this year the title has been changed to "Dosimetry and instrumentation." Why was that change in caption advisable?

Mr. FIELDS. Could I ask my budget officer to explain that?

Mr. MCCARTHY. This was just a merger, as I recall it, Mr. Chairman, of two previous categories.

Dr. DUNHAM. That is true. It also was felt that the new term is more properly representative of what was done. The other term, "equipment," suggested that we were buying equipment. This, however, is a program directed toward developing equipment.

Mr. CANNON. Now, whether there is sufficient reason for changing the terminology, it seems that you have materially increased the amount required here. Whereas last year you estimated in 1956 $1,024,000, it now seems from this budget that the 1956 estimate is to be increased to $2,095,000, and the 1957 estimate is to be increased to $2,365,000, a progressive increase, and a rather marked increase. There is some reason for that, of course?

Mr. FIELDS. The reason is because of the need for such instruments and in increased emphasis particularly in the design of instruments which are sensitive to high energy radiation. There is a specific need for the development of instruments, and the Commission seems the logical agency to develop instruments associated with the use of radiation materials.

Mr. CANNON. Is that the design of instruments?

Mr. FIELDS. It is the development of the design.

Mr. CANNON. Not the quantity.

Mr. FIELDS. Not the quantity.

Mr. CANNON. It follows the progress made in the study of the science of radiation?

Mr. FIELDS. Yes, sir.

Mr. CANNON. Is it a recurring item, or is it in the nature of a capital investment?

Mr. FIELDS. It is a recurring item, sir.

Mr. CANNON. We discussed a while ago this problem of activities directed from Washington, but again I notice that Washington will need additional equipment for the biology and medicine program.

Mr. FIELDS. In this program it is for the same purpose. It is for contracts administered from Washington, sir, and the equipment would be used in laboratories of institutions throughout the country, and not in Washington itself.

Mr. CANNON. That is the largest amount for the purpose you have had.

Mr. FIELDS. Yes, sir. The administration of most of these contracts is centered in Washington.

Mr. RABAUT. You talk here about developing equipment, rather than purchasing equipment. Has any thought been given to the fact that it might cost you more to develop it, or is it of such a nature that your needs could not be made known? It would not seem that this is the case, since you pass it out to other institutions for development. Would there not be people in the business of making ordinary equipment or extraordinary equipment that would probably be better set up to do it than you people would be?

Dr. DUNHAM. May I say a word on that? Part of our program actually involves research contracts with private firms in the equipment business. The major share of this money, however, goes to the on-the-spot development of special equipment which is needed by the physicists in their activities, whether they be with reactors or with the new high-energy machines. I can cite you an example of one of the pieces of equipment which was developed by private industry to meet a specific need. Industry was not improving this particular device because they foresaw no particular need for it. There were 2 or 3 places in the Commission where they needed it. The improved instrument made it possible, among other things, to do the work which demonstrated the presence of its antiproton. It is for that sort of thing that we use this money in order to stimulate people to do a job in a hurry to help the physicists.

Mr. RABAUT. Doesn't your argument fall into the category of placing emphasis on a single failure, and for that reason letting it affect everything that might be done?

Dr. DUNHAM. I don't follow you, sir.

Mr. RABAUT. Well, you are making the exception of the one case where they did not seem to realize the necessity for this instrument or for the improvements, whatever it was. It is something like saying some fellow did not get along with his wife; for that reason, marriage is no good.

Dr. DUNHAM. I was not implying that anybody had failed. I was merely saying that we have in this area a responsibility to point out from our knowledge of what is going on in the program, and some of this, of course, is classified, and what needs to be done. We do go to industry, we go to the national laboratories, and we go to the universities and say, "This is what the boys have to have, and they must have it in a hurry. Can you do it?" Nobody has failed. Don't misunderstand me.

Mr. RABAUT. I gather from this that you do receive other help in these things?

Dr. DUNHAM. Yes.

Mr. RABAUT. You go to certain industries that you know would be equipped to take on such a study, and go ahead with the making of the instrument and equipment you need.

Dr. DUNHAM. Very true.

Mr. RABAUT. Sometimes we find in Government such a terrific pride. The agencies of Government want to surprise the world with something that they did.

Dr. DUNHAM. We don't care who gets the instruments.

Mr. RABAUT. What we are looking for is results and 2 heads are always better than 1, as the old saying goes. You have your own ideas, and you hand it to somebody else to see what can be done. That is a lot of money, a quarter of a million dollars.

Dr. DUNHAM. It certainly is.

Mr. PHILLIPS. Mr. Chairman, I think inquiry might properly be made on the question of duplication. Aren't you getting into the same duplicating area with Civil Defense on a lot of this program that you are justifying today?

Mr. FIELDS. There may be some duplication in the use of certain types of instruments, but not a duplication of purpose. Our purpose is to develop instruments for civil defense. The use of that instrument, however, is different from the requirements we have for instruments.

Mr. PHILLIPS. Are you cooperating with them?

Mr. FIELDS. Very closely, sir.

Mr. PHILLIPS. How?

Mr. FIELDS. We have in the Division of Biology and Medicine, a branch dealing with the effects of atomic weapons. This branch collaborates closely with Civil Defense. As a matter of fact, we have, from time to time, had personnel working directly with Civil Defense for periods of time of from 4 to 6 weeks, on the civil-defense programs, including instrumentation. They are looking toward the development of simplified instruments of wide application for civilian-defense purposes. Most of our instrumentation work has a very specific purpose for use in our laboratories and for monitoring fallout.

STATUS OF CANCER AND GENETIC STUDIES

Mr. PHILLIPS. I would like this record to show definitely and in simple language at about this point that actually we do not yet, that is, the United States has not yet discovered a cancer cure, as you well know. Every time this is discussed before a congressional committee, we arouse the hopes of cancer sufferers throughout the United States as a result of the ensuing newspaper reports. I think we should say there has been as yet no cancer cure discovered, although, as Dr. Dunham has already testified, there have been marked encouraging advances in the field. I think in the same way, General, you spoke of brain tumors. I think we should make it clear that there is as yet no discovered cure for the brain tumor, although there are more encouraging advances there than in others.

For myself, I think advances have been made in the definition of the tumor which have made it possible to discover its area before cutting into the skull and to discover by the isotope method whether or not there is one actually there. It is much nicer to do that for the patient than to cut his skull open to find out.

The other thing I think we should make very clear in the record—I am still perhaps emphasizing this too much, you may think—but I think we should make it very clear from Dr. Dunham's testimony that there has yet been neither the time nor the opportunity to discover any variations as a result of the Hiroshima bombing or the use of radiation in the world, that there is no evidence whatever of any more mutations in the human race than perhaps would be the normal situation, and those nature very admirably takes care of herself and has done so over the centuries.

Mr. CANNON. I think that the gentleman from California has touched on a very important point. I think, as he very well says, that the point cannot be emphasized too strongly. First, that we have not discovered the origin of cancer, that we have not discovered a cure for cancer, and that we have not been able to show any change, any mutation, any aberration in genetics as a result of exposure to radiation.

Mr. PHILLIPS. Normal exposure.

Mr. CANNON. Mr. Jensen?

Mr. JENSEN. I think we should not build up the hopes of cancer sufferers or anyone who has a loved one or friend with a cancerous condition. Neither do I feel that we should discourage them. I am sure we have made some progress in the cure of cancer, especially in those cases which are brought to the doctors in time. Now, we know that by proper treatment, including this radiation treatment, that at least we have been able to arrest the growth of cancer in people. I have a friend that that has happened to. I feel that the money we spend, and I am on the Health, Education, and Welfare Committee, and we have these various doctors and surgeons and medical scientists come before our committee, and tell us what they have done, and the progress they have made. It was not very many years ago that a person with cancer was hopeless. As I said before, if we get the case in time, we can at least arrest it and many people have lived many years and are still living who would have been dead long ago had it not been for the progress that we have made in this field.

So we must not discourage them. We should encourage people to take their regular examinations, as most people are doing today, so that any trace of cancer may be found and immediately treatment taken. In the meantime I think we should go the limit in research such as you folks are doing and every sort of research, such as is being done today.

I know if I were a cancer patient, I would be living in hopes that a cure could be found before it was too late for me. Let us give them a little mental comfort. I do not want to give them too much encouragement. But neither do I want the word to go out that we have made no progress whatsoever in this field. I think that is criminal. Mental suffering is the worst kind of suffering that one can have. Fifty percent of the beds in the hospitals of America are occupied by mental patients, and that is alarming. We have this Bethesda Health Center out there where they are curing epilepsy. About 50 percent of the cases are being cured, 30 percent are being helped, and the 20 percent are not being hurt by the treatmnet. I think that is a great step, and we have made great strides in polio. We have made great strides in every field of medicine, and I think we have made quite encouraging progress in the field of learning a lot about cancer. Maybe we have not learned much about the cause of cancer, but we do know how to arrest it now if caught in time.

DISPOSAL OF ATOMIC WASTE

Now, leaving that, this morning we touched on the disposal of waste from your reactors. I can see that it is quite a problem. One would think that all you had to do was take it out to sea a hundred miles and dump it. Well, there is a lot of valuable life in the sea, too. About 12 percent of our raw products come out of the sea in the way of sea

food. So we do not want to contaminate the fish which the human beings eat.

Will fire dispose of the waste?

Mr. FIELDS. No, sir; fire will not. The ashes would still be radioactive. So the problem is to fix the radioactive material and to reduce them in volume. There may be other solutions. In chemical processes you have to treat the material in many chemicals in order to extract the uranium and the plutonium from a solution if it is in it. Then you have a large volume of chemicals in which radioactive materials are contained. Now, our problem is either to store the waste in that form, or to reduce the volume by separating the radioactive part so that the volume to be stored is greatly reduced, and then to fix that radioactive part of the waste so that it cannot be released in any fashion, and then either store it underground or bury it in the sea. But fire will not destroy the radioactivity present in the element involved.

Mr. JENSEN. You certainly could reduce it by the fire method to a very small amount of ashes.

Mr. FIELDS. Could I ask Dr. Dunham if he has a comment on that? The problem of reducing it in volume might involve something equivalent to a fire in chemical reactions.

Dr. DUNHAM. The problem is to reduce the radioactivity. The radioactivity in itself generates heat, producing so much heat that you would end up with a boiling mass of material.

There are several tricks that are being worked on, largely supported by the Reactor Development Division, to try to fix these radioactive wastes in such things as ceramics or by mixing concrete with the waste product, and then to let the heat that is generated boil off the steam, keeping the radioactive waste products in the concrete as it sets. But you cannot concentrate these wastes beyond a certain point without there being such a potent source of heat that you could no longer confine it. It is really quite a complicated problem.

Mr. CANNON. Mr. Taber.

EFFECTS OF RADIOACTIVITY ON HUMANS

Mr. TABER. I am afraid my contribution will be rather limited. Do I understand your work has been along the line of the injuries that the radioactive situation do to human beings? Is that right?

Mr. FIELDS. That is part of the program, sir.

Mr. TABER. I had one case where a boy had a job while he was on duty in the Army watching one of these radar boards, and as a result of that—I found out afterward there were quite a number of cases throughout the country—his eyesight was ruined, he was practically deprived of the ability to get around.

The radar boards that they have set up to show where different things are located out at sea, especially ships. Have you run into anything like that?

Mr. FIELDS. I don't believe we have had experiences in our own agency of that nature. You are referring to some of the screens, the luminescent screens that might be used on control instruments, for radar, which, if they have a radium dial or something of that nature, to cause luminescence, would give radiation to the person involved. I have heard of those things happening. I don't know of any such experience in the Atomic Energy Commission.

Dr. DUNHAM. I think perhaps Mr. Taber has in mind the problem of microwaves that cause cataracts.

Mr. TABER. It was not a cataract.

Dr. DUNHAM. But there are certain injuries that have occurred to people who have worked with microwaves.

Mr. TABER. It was the effect of radiation on the nerves and eyesight, and his whole muscular system.

Dr. DUNHAM. I know of no such case in the Atomic Energy Commission program. There have been radiation cataracts. I think this happened, almost 100 percent, in individuals who were working with cyclotrons before the days of the Manhattan project. Of course, there are the cases of the radiation cataract in the Japanese. I believe only 6 or 7 of whom have any actual impairment of vision. The other 150 can be detected by a physician with a sight lamp and they can see the little spots on the lens of the eye, but they are not interfering with vision.

Mr. TABER. That is all, Mr. Chairman.

COMMUNITY PROGRAM

JUSTIFICATION OF THE ESTIMATES

Mr. CANNON. We turn to the community program and at this point we will include in the record pages 122 through 128, inclusive.

(The pages of the justification follow:)

COMMUNITY PROGRAM—OPERATING COSTS

Program statement

Estimate fiscal year 1957	$17,950,000
Estimate fiscal year 1956	20,065,000
Decrease	2,115,000

The community program provides for housing, commercial facilities, utilities, hospitals, and municipal facilities and services in the AEC-controlled and operated communities of Oak Ridge, Tenn., Richland, Wash., and Los Alamos, N. Mex. These operations are carried out principally under cost-type contracts. Commercial facilities are operated by private enterprise through lease or concession agreement. Housing and utilities are provided for project-connected employees at Sandia, N. Mex., and certain locations in the State of Colorado.

The estimates reflect the impact of disposal legislation concerning the communities of Oak Ridge, Tenn., and Richland, Wash., as authorized under the Atomic Energy Community Act of 1955. The reduction of $2,115,000 in fiscal year 1957 costs is due primarily to anticipated sales of housing and other real estate holdings at Oak Ridge and Richland with a resultant decrease in maintenance and operating costs. The disposal program provides for the sale of residences and private-use buildings and lands to begin in fiscal year 1956, with a substantial portion of the sales being completed by the end of fiscal year 1957. Net proceeds derived from the disposal of property, after defraying expenses incident thereto, will be deposited in the United States Treasury, with a portion thereof being reserved to cover indemnities, and will not be credited to the AEC operating expenses appropriation. No municipal installations or utilities are planned for disposal prior to fiscal year 1958.

The estimated excess of costs over revenue of $1,453,000 for fiscal year 1957 is directly related to the disposal of housing and commercial properties at Oak Ridge, Tenn., and Richland, Wash., with a resultant decrease in rental revenues from real estate holdings. The revenues from community operations are included under the budgetary item "Revenues applied" as a reduction in the operating expenses appropriation. A summary comparison of community operating costs with revenues (exclusive of services provided production facilities) is shown in a table on the following page.

Summary of community program costs and revenues

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Operating costs:			
Oak Ridge, Tenn.	$8,991,124	$9,428,000	$8,368,000
Richland, Wash.	5,640,773	6,028,400	5,069,900
Los Alamos, N. Mex.	4,027,808	4,226,764	4,142,712
Sandia, N. Mex.	280,000	330,516	325,218
Grand Junction, Colo.	37,591	51,320	44,170
Total operating costs	18,977,296	20,065,000	17,950,000
Revenues (budgeted under revenues applied):			
Oak Ridge, Tenn.	10,105,219	9,590,000	7,456,000
Richland, Wash.	6,668,230	6,572,000	4,179,000
Los Alamos, N. Mex.	4,319,729	4,326,267	4,346,317
Sandia, N. Mex.	439,309	436,563	436,013
Grand Junction, Colo.	64,017	73,670	79,670
Total revenues	21,596,504	20,998,500	16,497,000
Net operating costs:			
Oak Ridge, Tenn.	−1,114,095	−162,000	912,000
Richland, Wash.	−1,027,457	−543,600	890,900
Los Alamos, N. Mex.	−291,921	−99,503	−203,605
Sandia, N. Mex.	−159,309	−106,047	−110,795
Grand Junction, Colo.	−26,426	−22,350	−35,500
Total	−2,619,208	−933,500	1,453,000

OAK RIDGE, TENN.

Oak Ridge, Tenn., is an AEC-owned and operated community for personnel at the production and research facilities. Plans have been formulated to offer for sale the housing and commercial properties to private owners. It is estimated that no transfer of service installations and utilities will be made during fiscal year 1957. Sales of property will begin in the latter part of fiscal year 1956 and it is currently contemplated that the sale of housing and commercial properties will be completed by the end of fiscal year 1958. Average population for fiscal year 1957 is projected at 30,000, the same as fiscal year 1956. Operating costs decrease $1,060,000 in fiscal year 1957 primarily as a result of reduced operating and maintenance costs for real property to be sold. The revenue decrease, $2,134,000 in fiscal year 1957, reflect loss of income from property being sold.

	Actual, fiscal year 1955	Estimated, fiscal year 1956	Estimated, fiscal year 1957
Operating costs:			
(a) Municipal	$3,921,496	$3,799,000	$3,786,000
(b) Utilities	1,150,537	1,245,000	1,239,000
(c) Real estate	2,456,271	2,534,000	1,625,000
(d) Hospital	1,269,801	1,268,000	1,268,000
(e) Property disposal	34,288	383,000	315,000
(f) Equipment	158,731	199,000	135,000
Total operating cost	8,991,124	9,428,000	8,368,000
Revenue (budgeted under revenues applied):			
(a) Municipal	506,164	556,000	723,000
(b) Utilities	1,922,955	2,060,000	2,125,000
(c) Real estate	6,467,600	5,772,000	3,406,000
(d) Hospital	1,208,500	1,202,000	1,202,000
Total revenue	10,105,219	9,590,000	7,456,000
Net operating costs:			
(a) Municipal	3,415,332	3,243,000	3,063,000
(b) Utilities	−772,418	−815,000	−886,000
(c) Real estate	−4,011,329	−3,238,000	−1,781,000
(d) Hospital	61,301	66,000	66,000
(e) Property disposal	34,288	383,000	315,000
(f) Equipment	158,731	199,000	135,000
Total, Oak Ridge	−1,114,095	−162,000	912,000

RICHLAND, WASH.

Richland, Wash., is an AEC-owned and operated community for personnel at the production facilities. Plans have been formulated to offer for sale the housing and commercial properties to private owners and to transfer municipal functions and facilities to local municipalities when local self-government is established. Sales of property will begin in the latter part of fiscal year 1956 and it is currently contemplated that the sale of housing and commercial properties will be completed by the end of fiscal year 1958. Average population for fiscal year 1957 is projected at 28,000, the same as fiscal year 1956. Operating costs decrease $958,500 in fiscal year 1957, primarily as a result of reduced operating and maintenance costs for real property to be sold and to nonrecurring disposal costs for plotting and appraising property in fiscal year 1956. The revenues decrease of $2,393,000 in 1957 reflects loss of income from property being sold.

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Operating costs:			
(a) Municipal	$2,016,134	$2,143,000	$2,142,000
(b) Utilities	738,619	733,000	764,000
(c) Real estate	1,869,409	1,887,000	1,100,000
(d) Hospital	987,951	898,000	905,000
(e) Property disposal	17,370	349,000	127,000
(f) Equipment	11,290	18,400	31,900
Total operating cost	5,640,773	6,028,400	5,069,900
Revenues (budgeted under revenues applied):			
(a) Municipal	110,563	138,000	177,000
(b) Utilities	1,487,336	1,445,000	1,477,000
(c) Real estate	4,351,814	4,338,000	1,874,000
(d) Hospital	718,517	651,000	651,000
Total revenue	6,668,230	6,572,000	4,179,000
Net operating cost:			
(a) Municipal	1,905,571	2,005,000	1,965,000
(b) Utilities	−748,717	−712,000	−713,000
(c) Real estate	−2,482,405	−2,451,000	−774,000
(d) Hospital	269,434	247,000	254,000
(e) Property disposal	17,370	349,000	127,000
(f) Equipment	11,290	18,400	31,900
Total, Richland	−1,027,457	−543,600	890,900

LOS ALAMOS

The community of Los Alamos, N. Mex., is an isolated, self-sustained community which was built and is currently maintained to support the research and development efforts of the Los Alamos Scientific Laboratory. Average population during fiscal year 1955 was 12,700 and will increase to approximately 13,000 in fiscal year 1957. The increase in municipal costs, over the fiscal year 1955 level, primarily reflects additional school costs resulting from a raise in teachers' salaries and a rising student enrollment. Average daily attendance is expected to go from 2,886 in fiscal year 1955 to 3,135 in fiscal year 1956 and to 3,375 in fiscal year 1957. Another increment in municipal costs is due to the Federal pay raise for Government employees who staff such municipal services as the fire and police departments. Costs for utilities increase in fiscal year 1956 and fiscal year 1957 because of the higher salary costs for the Government employees who staff the communication system and due to a commodity rate increase for gas. Operating costs decrease $84,052 in fiscal year 1957 attributable primarily to reductions in requirement for equipment. It is estimated that revenues will increase by $20,050.

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Operating costs:			
(a) Municipal	$1,131,762	$1,256,174	$1,295,888
(b) Utilities	660,025	723,971	724,935
(c) Real estate	1,422,939	1,397,232	1,376,502
(d) Hospital	639,082	646,387	646,387
(e) Equipment	174,000	203,000	99,000
Total operating costs	4,027,808	4,226,764	4,142,712
Revenue (budgeted under revenues applied):			
(a) Municipal	19,434	17,483	17,633
(b) Utilities	1,167,103	1,174,055	1,174,055
(c) Real estate	2,739,107	2,733,613	2,753,513
(d) Hospital	394,085	401,116	401,116
Total revenue	4,319,729	4,326,267	4,346,317
Net operating costs:			
(a) Municipal	1,112,328	1,238,691	1,278,255
(b) Utilities	−507,078	−450,084	−449,120
(c) Real estate	−1,316,168	−1,336,381	−1,377,011
(d) Hospital	244,997	245,271	245,271
(e) Equipment	174,000	203,000	99,000
Total net operating costs	−291,921	−99,503	−203,605

SANDIA

Sandia constitutes a small AEC community of 1,460 residents located within Sandia base at Albuquerque, N. Mex. The community is necessary in support of the Commission's Sandia Laboratory. The Sandia Corp., operator of the Laboratory, is responsible for the operation and maintenance of all AEC community facilities at Sandia base. No housing units have been constructed since 1951 and no further community construction is planned. The increase in fiscal year 1956 and fiscal year 1957 real-estate costs results from the fact that the units—houses, apartments, and dormitories—have reached an age which will require a more active preventative and corrective maintenance program. A stepped-up interior and exterior painting program, along with a maintenance program (i. e., heating units, roofs, hot-water tanks, walks, etc.) is planned for fiscal year 1956 and fiscal year 1957.

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Operating costs:			
(a) Municipal	$61,412	$70,148	$69,474
(b) Utilities	38,661	41,952	41,952
(c) Real-estate operations	179,927	218,416	213,792
Total operating costs	280,000	330,516	325,218
Revenue (budgeted under revenues applied):			
(a) Municipal	0	0	0
(b) Utilities	65,419	64,847	64,847
(c) Real estate	373,890	371,716	371,166
Total revenue	439,309	436,563	436,013
Net operating costs:			
(a) Municipal	61,412	70,148	69,474
(b) Utilities	−26,758	−22,895	−22,895
(c) Real-estate operations	−193,963	−153,300	−157,374
Total net operating costs	−159,309	−106,047	−110,795

GRAND JUNCTION

In order to maintain an adequate, competent, and stable labor force for processing and production operations, housing is provided at Uravan, Naturita, and Monticello processing plants. Also necessary to provide an incentive to miners in the Slick Rock area is the Government-owned housing at Slick Rock, Colo. At the present time, there are 150 housing units involved, 49 at Naturita, 68 at

Uravan, 28 at Monticello, and 5 at Slick Rock. Twenty additional houses are scheduled for construction early in fiscal year 1956 to provide housing for a portion of the additional personnel required in connection with the Monticello processing plant expansion, thereby making a total of 170 housing units. The housing is financially self-sufficient.

Operating costs will be higher in fiscal year 1956 because of necessary repairs to the Uravan and Naturita housing. Cost and income have been projected for the 20 additional units after January 1, 1956.

The comparison of revenues with operating costs for the fiscal years 1955, 1956, and 1957 is as follows:

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Operating costs:			
Real-estate operations	$37,591	$51,170	$44,170
Equipment	0	150	0
Total operating costs, Grand Junction	37,591	51,320	44,170
Revenue (budgeted under revenues applied): Real-estate operations	64,017	73,670	79,670
Total revenues	64,017	73,670	79,670
Net operating costs:			
Real-estate operations	−26,426	−22,500	−35,500
Equipment	0	150	0
Total net operating costs	−26,426	−22,350	−35,500

GENERAL STATEMENT

Mr. CANNON. Give us a statement, General Fields, on the progress made in the community program and your plans for the coming year.

Mr. FIELDS. Yes, sir. The community program provides for the operation of housing and commercial facilities, utilities, hospitals, municipal facilities and services in the Commission controlled and operated communities of Oak Ridge, Tenn., Richland, Wash., Los Alamos, N. Mex., and for the operation of certain housing and utilities at Sandia, N. Mex., and at certain locations in the State of Colorado.

Now, with respect to the larger communities, Oak Ridge has a population of approximately 30,000; Richland, Wash., a population of about 28,000, and the Los Alamos community roughly 13,000. So the program primarily covers the costs of real estate, utility, municipal, and hospital operations. These are the budgeted costs.

In another section of the budget we show the revenues that are derived from the operation of the communities, that is, the return on rents and utilities. We are estimating a decrease in the operating cost for fiscal year 1957 because of the disposal of real estate in the communities of Oak Ridge and Richland, as authorized by the Community Disposal Act of 1955 and under which steps toward the disposal have been taken.

The program involves the disposal of the housing and eventually the transfer of community facilities to the Communities over a period of time.

We anticipated that the sales would start shortly and are hopeful that they will. If the sales do proceed, our costs will go down, because as these houses are sold, our requirements for maintenance are reduced. That is why we reflect a decrease in operating costs.

At the same time, however, our revenue from this real estate will be reduced by more than the decrease in the operating cost. In fiscal 1956 our estimate is that net result of our operation of the community facilities would be a return to the Government of $1 million, that is our revenues will exceed operating costs by that amount.

For fiscal year 1957, however, there will be a net operating loss of $1,400,000. That difference is due to the fact that the revenue is estimated to decrease by $4.5 million in the fiscal year 1957, because of the disposal operation, and costs will be reduced by $3.1 million.

The operating costs of the several communities are shown on the various pages here. They have been relatively stable over the last several years. The change that is now coming about is due to the disposal of the communities.

If the sales do not proceed as estimated, and the chances are that it will vary somewhat, and if they are delayed, we will continue to maintain the houses and to operate the utilities. As a result we would get increased revenues and the costs would increase also but not to the same extent. The net effect therefore, would be a higher return to the Government than we have forecast in the budget. Do I make myself clear there, sir? If there is a delay in disposal we will have to operate the utilities, maintain the houses, and rent them for whatever period of time is involved, but in that time we will still be collecting rents and payments for utilities, so that the situation would be more comparable to the 1956 situation than to the one estimated for 1957 where we will be operating at a net cost to the Government.

COMMUNITY OPERATION AT OAK RIDGE

Mr. CANNON. In 1945, I think it was, when the gentleman from New York, Mr. Taber, and I, at the request of the Secretary of War, were flown by the War Department down to Oak Ridge for the first time—was that 1944 or 1945, John?

Mr. TABER. About the first of May 1945.

Mr. CANNON. It was in the spring of 1945.

Mr. TABER. Yes.

Mr. CANNON. To our astonishment we found the Government had gone out in the fields and forests and had built a modern city with a population at that time of 40,000 or 50,000. The Government had built the city and the Government owned everything, the residences, the business houses, the churches, the theater, all utilities, the sewage, water, gas and electric systems; it owned everything and rented to the plant employees.

Incidentally, was that a profitable investment for the Government? Did the rent received cover investment and cost of maintenance?

Mr. FIELDS. I don't believe it covered investment; that is, it did not cover depreciation. We have never factored depreciation into the budget itself. During that period of time also, I believe that even on the operating basis, excluding depreciation, it resulted in a cost to the Government. I would have to go back and check. I am not familiar with operations during that period of time.

Mr. CANNON. Suppose you include that at this point. I take it for granted all utilities were operated at a reasonable profit, at least they paid their own way.

Mr. FIELDS. I am not sure during that period of time. I will have to go back and check that, sir. In the last few years we have operated on the basis of a net return to the Government, excluding depreciation.

(The information requested is as follows:)

Since a detailed cost accounting system was not established until after fiscal year 1949, segregated records of housing operations, on a consistent basis, have only been available since 1950.

Real-estate operations, Oak Ridge, fiscal years 1950–55

[In thousands]

	1950	1951	1952	1953	1954	1955	Total
Revenues:							
Housing	$3,816	$3,861	$4,037	$4,159	$4,614	$5,186	$25,673
Dormitories	71	106	100	93	139	198	707
Concessions and other rentals	908	982	1,040	989	1,072	1,083	6,074
Total	4,795	4,949	5,177	5,241	5,825	6,467	32,454
Operating costs: [1]							
Housing	2,946	2,302	2,566	2,679	2,195	1,938	14,626
Dormitories	224	205	160	192	157	171	1,109
Concessions and other rentals	542	493	465	421	368	347	2,636
Total	3,712	3,000	3,191	3,292	2,720	2,456	18,371
Net:							
Housing	870	1,559	1,471	1,480	2,419	3,248	11,047
Dormitories	(153)	(99)	(60)	(99)	(18)	27	(402)
Concessions and other rentals	366	489	575	568	704	736	3,438
Total	1,083	1,949	1,986	1,949	3,105	4,011	14,083

( ) Denotes excess of operating cost over revenues.

[1] Exclusive of depreciation.

Real estate operations, fiscal years 1950–55

[In thousands]

	1950	1951	1952	1953	1954	1955	Total
Revenues:							
Housing	$2,395	$2,394	$2,531	$2,723	$3,407	$3,564	$17,014
Dormitories	156	166	182	186	207	206	1,103
Concessions and other rentals	326	544	560	527	626	582	3,165
Total	2,877	3,104	3,273	3,436	4,240	4,352	21,282
Operating cost: [1]							
Housing	1,125	1,670	1,563	1,411	1,507	1,422	8,698
Dormitories	353	400	345	286	266	273	1,923
Concessions and other rentals	251	242	232	196	217	175	1,313
Total	1,729	2,312	2,140	1,893	1,990	1,870	11,934
Net:							
Housing	1,270	724	968	1,312	1,900	2,142	8,316
Dormitories	(197)	(234)	(163)	(100)	(59)	(67)	(820)
Concessions and other rentals	75	302	328	331	409	407	1,852
Total	1,148	792	1,133	1,543	2,250	2,482	9,348

( ) Denotes excess of operating cost over revenues.

[1] Exclusive of depreciation.

STATUS OF DISPOSAL AND LIQUIDATION

Mr. CANNON. Now, the Government proposes to rid itself of these huge investments in these two cities built by the Goverment. Have you taken definite steps toward liquidation of these two cities?

Mr. FIELDS. There have been steps taken in accordance with the Community Act of 1955. In accordance with the provisions of that

act, the President assigned to the Housing and Home Finance Agency the responsibility for the sale of the properties in the communities; and one of its agencies, the Federal Housing Administration, has made the appraisal of the properties.

While they have made the appraisals, they have not as yet initiated the sales program, but we have reached the point of proceeding with this part of the program.

There has arisen at Richland, as we discussed the day before yesterday, quite a bit of concern on the part of the local people that these appraisals are too high. They would be buying houses on which, they say, the appraisals have been too high. So there has been considerable concern on their part, and they are bringing this issue to the attention of the Joint Committee on Atomic Energy to which disposal legislation would be referred. The committee is holding hearings on this subject next week. But we have reached the point where the sales could start.

METHOD OF SALE

Mr. CANNON. Does the proposal involve sale piece by piece or by areas? Does it involve the sale at auction or is it limited to private sales?

Mr. FIELDS. It is generally piece by piece to individuals. There are priorities provided for by the act so that the resident of the house gets certain preferences with respect to purchase. He has first call on that house if he wants to exercise it. This will require, as I recall, a period of 90 days after the announcement of the beginning of the sale. He has 90 days in which to exercise his priority. In the event he did not purchase it, there are priorities where others on the project would have priority to purchase his house if he did not want it and finally it would be offered on open sale.

The concessions similarly are to be disposed of and then I believe, lastly, the municipal facilities, which would be dependent upon incorporation for the operation of the municipality.

Now, the Richland Town Council has met and passed a resolution looking toward incorporation in July 1957. As yet at Oak Ridge there has been no such resolution.

Mr. CANNON. They are not under municipal government at this time?

Mr. FIELDS. No, sir.

Mr. CANNON. They are being administered by the department?

Mr. FIELDS. Yes, sir; except that the State has jurisdiction over the towns. The operation of the schools is under the direction of the school boards in the areas.

Mr. CANNON. Are those school boards elective or appointed?

Mr. FIELDS. I believe they are elective in each case.

Mr. CANNON. But there is no elective town administration.

Mr. FIELDS. There are advisory town councils at each location but as yet there are no legally incorporated municipal bodies.

PROBLEM OF APPRAISALS

Mr. CANNON. Will you have any difficulty in disposing of this property at a reasonable price, that is, one that will not involve too great a loss on the part of the Government?

Mr. FIELDS. No, sir; not if it goes forward as it seems to be going. However, with respect to Richland, where the population is much concerned about the appraisals, a solution must be found before the sales program can go forward.

Mr. CANNON. But all these buildings were erected early in the war and while limitations were still extant and most of them were erected with material and labor which cost vastly below the cost of replacement today.

Mr. FIELDS. I believe that is correct, but some were built after the war. I do not know the exact numbers of each at these installations.

Mr. CANNON. Those we saw at Oak Ridge were in complete repair and complete operation in 1945.

Mr. FIELDS. That is true.

Mr. CANNON. All had been built during the war and under war restrictions with restricted prices on material and labor. They were built at a cost which, although there has been a heavy depreciation in the meantime, ought to permit them to be sold without too great a loss to the Government.

Does the Commission have anything to do with the sale or is that handled entirely by another branch of the Government?

Mr. FIELDS. The Housing and Home Finance Agency has been assigned the responsibility for the appraisals and the conduct of the sales.

Mr. CANNON. What authority do you have over that Agency?

Mr. FIELDS. We have none at this point. If we become concerned as to the feasibility of this program going forward, I think we could step in and see that something is done. At the moment we are hopeful that it can all be worked out effectively.

DESIGNATION OF PRIORITIES FOR OCCUPANTS

Mr. McCarthy has just reminded me that we do have the responsibility for the designation of the priorities, because we know who the priority holders should be. The right of priority depends on their position and their activity in this program.

Mr. CANNON. Mr. Rabaut.

Mr. RABAUT. Following the line of questioning of the chairman, who did you say was making the appraisals on the property to establish the price of sale?

Mr. FIELDS. The Federal Housing Administration, sir.

Mr. RABAUT. And there are going to be piecemeal sales?

Mr. FIELDS. They have made their appraisals. These will be published. Then they will announce the sales program on a body of houses, probably the bulk of them, I imagine, at one time. Then the priority holder has 90 days in which to exercise his right.

Mr. RABAUT. That is the resident?

Mr. FIELDS. That is the resident.

Mr. RABAUT. He has 90 days.

Mr. FIELDS. He has 90 days in which to determine whether he wishes to buy the property under the terms presented.

Mr. RABAUT. We will say in a block of 20 houses that you sell 14. That is 14 decide to buy them. You then have six houses in that block now that still belong to the Government.

Mr. FIELDS. Yes, sir.

Mr. RABAUT. Are they identical houses?

Mr. FIELDS. Many of them are identical houses. They vary of course by site, location, and ground.

Mr. RABAUT. So the better houses we will take for granted will be sold, and the less desirable locations will probably be held by the Government. So the Government is going to be in this deal anyhow, probably at greater inventory than it was before. What is going to happen to the utilities that supply energy or necessities to these houses?

Mr. FIELDS. I understand that as the communities are incorporated and begin to operate, that the act provides for the transfer of utilities to the community government. Is that correct, Mr. Ohlke?

Mr. OHLKE. The statute provides that for a period of 5 years following the enactment of the statute, the residents can accept transfer of installations and utilities. However, there is no way in which the Commission can force the disposal of the utilities and the municipal installations.

Mr. RABAUT. I know there is a law on this, something has been established for this sale, but it seems to me these houses should have been sold in certain blocks and then the people under the sale should have had a right to buy back and not leave the Government holding a certain number of them.

Mr. OHLKE. Sir, there is a system of priorities in which the occupant of each house, single and duplex house, gets the first opportunity to buy.

Mr. RABAUT. I understand, but he could have that under an arrangement by which the houses are sold as a group.

Mr. OHLKE. After the occupant, other residents and projected connected people have priorities similarly. The statute provides that after all priority offerings are made, for a period of a year the houses will be offered at the appraised value. After that period of a year, the houses will be offered at competitive bid.

Mr. RABAUT. So under that system the better locations of similar houses will be taken up, and the less desirable houses will be left for competitive bids a year afterwards, and the Government will get less. You said there are some complaints as to the appraisals put on the houses recently in one place.

Mr. FIELDS. Yes, sir.

Mr. RABAUT. Who made the appraisals of the houses?

Mr. FIELDS. The Federal Housing Administration.

Mr. RABAUT. Well, I think the appraisals ought to stand then and we should go through with the deal under those appraisals. As the chairman just said, the houses were built at a time when the cost of construction was a whole lot less than today. Anybody that can buy a house for no more money than was paid for it at the time it was built can consider himself fortunate in purchasing a house today.

That is all, Mr. Chairman.

Mr. CANNON. Mr. Riley.

RESPONSIBILITY OF HOUSING AND HOME FINANCE AGENCY FOR SALES

Mr. RILEY. General Fields, I presume that the Federal Housing Administration will sell these houses on terms just as all FHA houses are sold?

Mr. OHLKE. The statue provides that the FHA financing will be available. In the absence of sufficient private lending resources, the selling agency is authorized to take direct purchase money mortgages on the same terms as provided for FHA.

Mr. RILEY. That is all, Mr. Chairman.

Mr. CANNON. Mr. Evins.

Mr. EVINS. General Fields, I notice in your justification you anticipate there will not be any disposal until after 1958?

Mr. FIELDS. No, sir, we anticipate disposals starting in fiscal year 1957.

Mr. EVINS. You have no way of projecting how long a time the program will entail.

Mr. FIELDS. No, sir; we do not.

Mr. EVINS. You have already outlined the mechanics of the disposal but it is unique in that the General Services Administration, GSA, has a disposal division, surplus property disposal. Were they brought into play at any time in the proceedings?

Mr. FIELDS. No, sir, they have not been brought into this. This disposal is perhaps of a different nature than their activities generally. It is the disposal of a going community, and must be handled so that it can continue in operation.

Mr. EVINS. Has the Housing and Home Finance Agency had extensive experience in this field, or is it novel and unique in its function?

Mr. FIELDS. I cannot answer that, sir. I have no knowledge of their qualifications to handle this program.

Mr. EVINS. They have the ability to appraise the value and they have the ability to finance them, but my question is directed to whether or not they had disposed of other housing projects or similar communities elsewhere.

Mr. FIELDS. I don't know, sir, whether they have or not.

Mr. EVINS. If they have not, you might well anticipate that it will probably be a protracted process.

Mr. OHLKE. Could I speak to that?

The Housing and Home Finance Agency has had experience in selling houses. The PHA, which is part of the Home and Housing Financing Agency, disposed of Greenbelt. The Atomic Energy Community Act provides that functions can be assigned to other agencies. In considering this problem GSA was considered, but GSA mainly has had experience in disposal of surplus property, and this is not surplus property. The Bureau of the Budget was consulted in this matter, and the GSA and the Housing and Home Finance Agency were both considered. It was the unanimous consent, if I might use that term, that this would be a function best suited to be assigned to the HHFA.

Mr. CANNON. Mr. Phillips?

DELAY IN DISPOSAL OF COMMUNITIES

Mr. PHILLIPS. Let us get down to a little realism on this picture. How long has it been since the subcommittee instructed you to get rid of these towns?

Mr. FIELDS. Quite some time, I believe, sir.

Mr. PHILLIPS. There has been very little strong energetic effort to get rid of them in the intervening time. Your friend back there on the back seat says it was passed around from one agency to the other. Isn't it a fact that the principal reluctance to get rid of this is due to the feeling of the people who live in the communities that they would

prefer to cling as long as possible to the very generous subsidies of the other taxpayers of the United States before giving them up for what every other homeowner has to pay in the United States? I am putting it in very simple language, General Fields.

Mr. FIELDS. That may be a factor.

Mr. PHILLIPS. You know very well it is a factor. The fact of the matter is that we had very much the same situation with communities in Greenbelt and so forth, and housing projects with the HHFA, and we ended up, as Mr. Evins knows, by practically setting up a little agency, subagency, or a part of the major agency whose objective was to get rid of these towns.

Now, are we going to have to do the same thing with you or will you get rid of them? Are you or will you get rid of them? Are you going to take another 5 years to do it?

Mr. FIELDS. I hope not, sir.

Mr. PHILLIPS. I am not in favor of giving you $912,000, which I think is outrageous, for Oak Ridge and $890,000 for Richland, when these communities ought both to have been disposed of years ago, to the benefit of the people who could live in them. That $900,000 is a loss we are talking about. I am a little bit discouraged on this business, and I am of a mind to hope that the committee will take this firmly in its hands and either hand it over to somebody else to sell or take away your money so that you will have to sell it.

Mr. FIELDS. Mr. Phillips, the Community Disposal Act of 1955 is so framed that it does call for continuing making assistance available to the communities over a period of 5 years.

Mr. OHLKE. The assistance is for 10 years.

Mr. PHILLIPS. Are you suggesting we recommend changes in the act, so that we can get rid of them? You have not sold a single one of those houses, have you?

Mr. FIELDS. We have sold some of the lots at Oak Ridge. As I recall, they were sold directly by the Commission.

Mr. PHILLIPS. If you sold anything, it was commercial property; was it not?

Mr. OHLKE. Under the statute we were authorized to sell the leased lots on which there were some privately built houses.

Mr. PHILLIPS. Were they not separated from the main body of the houses?

Mr. OHLKE. They were in what you might call a subdivision; yes, sir. The statute directed that initially the Atomic Energy Commission delegate such functions to other Federal agencies as might be qualified to perform the other functions. For that reason the President by Executive order assigned the sale and financing functions to the Housing and Home Finance Administrator. The sale and the financing are in his hands.

EXPENDITURES AND REVENUES FOR OAK RIDGE AND RICHLAND COMMUNITIES

Mr. PHILLIPS. Now, this thing started 4 years ago. How much have we spent in the past 4 years just underwriting Oak Ridge and Richland?

Mr. MCCARTHY. I don't know the exact figures, but I would say cumulatively we have in the past 4 years received more revenue than

it was cost us to operate the community. Now, this is not counting the depreciation, of course.

Mr. PHILLIPS. You mean to say that all, whether it be fixed charges and all things that enter into the operation of a normal community—you don't show it, because at Oak Ridge you show $8 million expense and $7 million income.

Mr. MCCARTHY. This is true in 1957. I am excluding that year. I was going back from 1956.

Mr. PHILLIPS. You mean you took in a certain amount of money and paid out a certain amount of money, but you did not charge any of the normal expenses, and you did not charge for any of these services that you give at Richland which is charged to some other section?

Mr. MCCARTHY. We include the cost of all of the services.

Mr. MILLER. We charged all cost, all overhead, and all indirect costs to the program. The only thing that is not included in the budget is depreciation. It covers all costs as determined under the normal accounting procedures.

Mr. PHILLIPS. No depreciation, interest, taxes?

RENTAL BASIS FOR HOUSES

Mr. RABAUT. Have you put any appreciation on it?

Mr. MILLER. No, sir.

Mr. RABAUT. Don't you think it probably deserves it?

Mr. FIELDS. We have never put appreciation in the budget.

Mr. RABAUT. Is the house worth more money today than it was at the time it was built?

Mr. FIELDS. I think the appraisals in many cases are higher than the the remaining book value.

Mr. RABAUT. Most every house that is sold today has an appreciation in value because of the fact that it was erected in 1945. You all know that. I have never seen this property. Has it been kept in good repair?

Mr. FIELDS. Yes, sir.

Mr. RABAUT. If it has been kept up, there should be an appreciation in its value.

Mr. FIELDS. One would think so; yes.

Mr. RABAUT. How much would the rents have to be raised, for instance, if you were to try to make up for this loss that is being claimed here, to make up the sum herein requested?

Mr. FIELDS. If we dispose of the housing, we will not be in a position to collect any rents.

Mr. RABAUT. If you dispose of it, you are going to start to get interest on the balance of the debt or under the terms for which it is sold. You are going to get a downpayment. You don't expect to sell each place for cash?

Mr. MCCARTHY. The Atomic Energy Commission would not. The proceeds of the sales will be deposited with the Federal Housing Administration. So that to us there, no money would accrue from the sales.

Mr. RABAUT. The point is not to whom, but the point is that eventually the Government is going to take a loss or profit. From everything we see under the plan it is going to be a loss. We feel that probably it ought to be a profit. That is the point.

Mr. PHILLIPS. Mr. Rabaut, even if we have made no profit you have put your finger on an extremely important point. These houses were built in 1945, they have been well kept up, and now the AEC comes to us and says they cannot sell them for what they built them for.

Mr. RABAUT. The occupants won't even accept the appraisal. They want a new and lower appraisal.

Mr. FIELDS. This is the local people who are saying this. It is not the Commission.

Mr. RABAUT. We are talking about a proposition in which the Commission is the only group that can come here and present this to talk about it. You are close to the problem. It is not that we feel we have an inferior property to sell. We think there should be an appreciation on these houses. You cannot buy a house any place that was finished at that time and especially if it was kept up, that is not worth more today.

Mr. PHILLIPS. I just think you have to put a little effort on selling those. You asked if they had service. They had all kinds of services. If you blow out a fuse you don't go down to the store and buy a new fuse for 20 cents. You call the United States Government and down comes a truck with three people on it. One drives the truck, the other one goes in and says "Yes, you need a new fuse." Then he comes out and a third person goes in and screws in the fuse.

Mr. EVINS. When he and Mr. Rabaut referred to "down there," I wish he would also say "out yonder," too.

Mr. RABAUT. Out in the West, that is right.

Now, I want to say this. As long as this proposition is with your agency, and it is going to be with your agency until something is decided about it, how much would the rents have to be increased to make up this deficit? That is a difficult question to answer on the spur of the moment, but I mean roughly.

Mr. FIELDS. I don't see how I can answer the question, because if the disposal proceeds——

Mr. RABAUT. Never mind the disposal. That has a big "if" on it. It has been dragging along for 5 years. How much would the rents have to be raised?

Mr. PHILLIPS. They could put in appreciation and taxes and make this a good selling deal.

Mr. RABAUT. Don't change the whole system, just the rents. Leave everything else in status quo until the sales are made. Lift up the rent and see if we can recapture this money.

Mr. EVINS. I think the committee at various times has demonstrated its interest in the HHFA proceeding with this matter. That is the reason for my question as to why the HHFA is doing the job instead of the General Services Administration which is equipped to do work in the field of surplus disposal. You tell us the decision was made by the Bureau of the Budget in this matter. Is that not correct?

In other words, delay is going to be entailed because of the multiplicity of agencies involved.

Mr. FIELDS. I don't believe so, sir. We are now in a position where the appraisals have been made and the sales will be made shortly.

Mr. PHILLIPS. Mr. Ohlke said technically these are not surplus property, therefore they could not sell them. I would like to know who made that decision?

Mr. CANNON. General Fields, as long as the occupants of such property can rent it for less rent than they would pay for similar accommodations in any other city in the United States and with no taxes to pay, they will never buy it. If you raise the rents to what they would have to be to pay for similar accommodations in the average American city, then you can sell it. You will never sell it until you do.

Mr. FIELDS. Mr. Chairman, over 3 years ago the Commission established rents in these communities on the basis of prevailing rents in those areas. That is an action we took some years ago. We did raise the rents at all of our communities, and therefore operations of the last few years were not a cost but have resulted in a net return to the Government, without regard to a return on the capital investment. We have raised the rents and the rents are at the prevailing rates in the areas concerned.

Mr. CANNON. What is the cost for similar accommodations in the average American city? I have been told there is no incentive for any man who can rent this property from the Government at a low rental with no taxes to pay, no incentive for him to buy and that they will never buy until you put the rents at a rate commensurate with that which they will have to pay for like accommodations in like cities.

Mr. FIELDS. When we did this, we had appraisals made, looked at the rents being paid in the surrounding area, and then raised these rents to those levels. We can provide you for the record what the rental rates are in these different communities. I am under the impression that they are not low compared to the other communities in the area.

Mr. CANNON. They are too low until they bring in an adequate return on the capital investment. Now, the capital invested there is far below the capital in any other American city, and still the rent is not sufficient to bring in an adequate return. Now, until the rentals there bring in an adequate return on the investment, and the investment is phenomenally low, your rents are too low, and you will never sell a single house.

Mr. RABAUT. Mr. Chairman, this investment is not considered in this deficit we have here. The investment is not even included in this. This is an expense over and above the investment.

Mr. CANNON. If a corporation owned those houses they could not operate the project on those low rents. They would not bring in a return commensurate with the investment. You have a low investment there, considering the low cost of construction, and the fact that the houses have been kept up. I know of one man recently who was an employee of this committee who sold a house here that he bought when he came to Washington. He sold it for more than twice what he paid for it, simply due to the increase in the cost of construction and cost of replacement. Now, if it was a corporation investment, they would have to get enough to cover cost of operating and to pay a reasonable return on the investment, and those houses there are not paying such a return. Your report here shows it.

Mr. JENSEN. Mr. Chairman.

Mr. CANNON. Mr. Jensen.

Mr. JENSEN. Everybody in Oak Ridge works at the plant. They are employees of the Government?

Mr. FIELDS. They are employees of Government, or they operate concessions in the towns. They are associated with the program at this time.

Mr. JENSEN. How many people are living there now in Oak Ridge?

Mr. FIELDS. The population as I recall is about 30,000.

Mr. JENSEN. And they have all the facilities, I mean all the utilities, sewer, lights, water, power, electric energy——

Mr. EVINS. Will the gentleman yield? When you gentlemen quote figures, and speak of Oak Ridge, Tenn., I suggest that you supply figures and refer also to Richland and Hanford and the other towns, and not single out just one. I think the controversy yesterday was in regard to Richland, which was much farther advanced in the disposal process.

Mr. JENSEN. Most of them I assume are in the same category.

Now, a person who does not have a concession or who does not work for the Government would have no incentive, there would be no incentive for him to move into the town just to live there? There must not be, because you say there are no others.

Mr. FIELDS. Housing has not been available for others up to this time. I don't know, but there may be an incentive for individuals to come in when it becomes a normal community.

Mr. JENSEN. That is why the return is low, the fact that there is not a market for the houses because there is no one coming in, and wanting to buy homes in those areas. So it is completely a matter for the Congress and the committee to handle and as Mr. Rabaut has so well said, that as long as they can get rentals only for the price they are renting today, and my guess is that if you were to compare the rents that are being charged to the people in those areas with the rentals which are paid in other towns of that size, you would find that the rentals in these Government installations which are under consideration would be considerably less than in towns of comparable size in the neighboring area. So I think a new appraisal should be made by your Commission in the light of that situation which I have just explained.

Now, I can understand that those people that live there are no different than anybody else. They want to get the rent as cheap as they can.

Mr. FIELDS. Mr. Chairman, could I comment to Mr. Jensen?

Mr. JENSEN. I might say this. We had the same situation in Boulder City. A number of years ago I went out there with two other Members of Congress. We took a good look at it ourselves. We found out what they were paying for rents. We said, "You are going to have to raise these rents or we are going to make an issue of it in Congress, maybe on the floor of the House." They raised them and they did not mess with it.

Mr. FIELDS. Mr. Chairman, would it be possible for me at this point to insert the rents? I do not have them with me but to have them inserted for the record?

Mr. CANNON. Mr. Taber.

Mr. TABER. Do you know what any of these rents are, General?

Mr. FIELDS. I know, for instance, that in the community of Sandia rentals are as high as $80 and $90 a month, and are even as high as $120 a month for some of the quarters at that location. We did look

at rents in the communities in the area several years ago in conjunction with a study of our rents. At Los Alamos we made comparisons with rents at Santa Fe and at Albuquerque. As we adjusted to these rentals, we raised our rents and I am under the impression that they were the going rate in those other communities. So I don't believe the rentals are as low as seems to be your impression.

Mr. TABER. If you do not know, I think you might as well cut it out, because the more we clutter up the record with what you suppose or you guess, the worse we will be off. We might as well let you furnish a statement on what the rents are the way the chairman asked you.

Mr. PHILLIPS. Mr. Chairman, you want the rents for all of them or the ones at Richland and Oak Ridge? The ones we are trying to sell?

Mr. CANNON. If it is agreeable to the committee, we will ask General Fields to supplement his testimony here with a comprehensive, factual report, giving first the percentage of occupancy of all buildings, giving, second, the percentage of employment of all heads of families as nearly as it can be ascertained, giving, third, the cost of construction of these various properties it is proposed to sell, fourth, the status of repair at this time, fifth, average rentals, and in that connection the entire income to the Government from all sources derived from ownership of this property, sixth, taxes paid, municipal, State, and Federal, if any, and charges paid—if there is no local tax paid—and amounts paid in municipal, State, and Federal taxes by similar cities. In addition include what they would have to pay if each man paid taxes on his own property.

Mr. RILEY. Could he include in that the average rent for a 1-bedroom house, 2-bedroom, 3-bedroom, and 4-bedroom house?

Mr. CANNON. Yes. I think we should make that distinction. You should treat them as groups.

Mr. PHILLIPS. Mr. Chairman, there are two answers we should know before we make a final decision, after getting the information you ask for as to what we want to do about this, and I think the General can answer them now.

The first is, in these two cities we are trying to sell, aren't concessions limited? You could not go in with as many grocery stores as you wanted to in the community, could you? Wouldn't you have to get permission of the managers of the property to open a store?

Mr. FIELDS. At the present time, but we have been developing new commercial properties.

Mr. PHILLIPS. My point is that they really are not open cities. When Mr. Jensen asks if other people would want to move in, there is not the normal competition which would cause the cities to develop, or people to open any of the various retail stores which are found in the normal city if they wished to do so?

Mr. FIELDS. Oak Ridge is an open city now, and there has been the development of a new commercial area.

Mr. PHILLIPS. In other words, the chances of selling Oak Ridge ought to be better than they were before. The second thing is that it might be well in the general statement supplementing the questions that the chairman asked before, the information the chairman asked

for before, if we could know what services are presently supplied free of charge in the community.

Now, that would be police, fire. They don't pay for water, I suppose.

Mr. FIELDS. They pay for water.

Mr. PHILLIPS. Well, the things they don't pay for, which if this were a city they would have to pay for or the houseowner would have to pay for through taxes which at the present time the Government pays. I don't care whether you get this down to the individual houses or anything like that, but which of the services there are that are paid for.

Mr. CANNON. Let me add a last item. Also give us the itemized cost of operation and maintenance.

Mr. FIELDS. Of the community?

Mr. CANNON. Paid by the Government. Yes.

(The information is as follows:)

The communities of Oak Ridge, Tenn., and Richland, Wash., were originally constructed during the war to house in restricted areas the military and civilian employees connected with the operations of the plants engaged in atomic energy work. In addition to housing, retail establishments necessary for the minimum needs of the residents for goods and services, were provided. Since the facilities were constructed for the purpose of providing Government quarters, they do not represent normal taxable values such as will be found in communities of comparable size. The main industry connected with the communities is the Government plants, which provide no tax base for the operation of the communities.

The major provisions of the Atomic Energy Community Act of 1955 (Public Law 221) are based on these considerations. These provisions provide that the houses will be sold on the basis of their appraised value and, if not sold on this basis, then on the basis of open competitive bidding. The act also provides that the community facilities be transferred to the city, if incorporated. Because of the initial low-tax base, it is our belief that it would be unrealistic to expect a new community to be able to absorb during the initial period of operation the cost of acquiring such facilities and of paying all operating expenses. This burden, in fact, would be so great that we doubt whether disposal could be accomplished on such terms.

The following is the information requested:

1. AVERAGE OCCUPANCY OF RESIDENTIAL PROPERTIES, OAK RIDGE AND RICHLAND FISCAL YEAR 1956

	Oak Ridge	Richland
	Percent	*Percent*
Family housing	91.1	99.6
Dormitories	79.1	74.4

2. EMPLOYMENT OF OCCUPANTS OF HOUSING

Only individuals employed on the project are eligible to rent housing or dormitory rooms owned by AEC. Those who become unemployed are given 30 days' notice to vacate their accommodations.

3. Gross Investment in Communities,[1] June 30, 1955

[In thousands]

	Oak Ridge	Richland
Real estate:		
Housing	$54,276	$54,466
Dormitories	3,524	1,262
Concession and other rental property	8,648	3,127
Total	66,448	58,855
Utilities	22,765	13,708
Hospital	1,397	1,446
Municipal	33,129	29,968
Total	123,739	103,977

[1] Excludes private property constructed on leased land.

4. Normal maintenance has continued and is current on all properties now in use, which will be offered for sale in place. About 450 small demountable houses at Oak Ridge have not been kept in normal repair, as they are marked for sale for removal by the purchasers.

5. AEC Rent Policy

Rents charged occupants of AEC housing, in accordance with a policy adopted by the Commission in 1949, are comparable with those charged by private landlords for similar accommodations in surrounding communities. Comparability has been determined by professional real estate appraisers employed on a fixed-fee basis. Thet rent schedules now in effect are deemed to be in accord both with AEC policy and with the requirements of Bureau of the Budget Circular A–45 entitled "Rent Policy for Quarters Supplied Federal Employees," issued in July 1951, amended in June 1052, and made a statutory requirement upon adoption of section 1413, Public Law 547, 82d Congress, "Supplemental Appropriation Act of 1953."

In 1949 rents in AEC communities were substantially lower than those prevailing in surrounding communities. This was because it had been necessary during the war to set rents low enough to attract personnel to work and live under conditions of secrecy, inside security barriers, in communities that were hastily built of wartime materials. Rents were adjusted, after adoption of the present rent policy in 1949, according to the following schedule:

Richland

August 1949: Rents were increased an average of 15.9 percent. Charges ror water, electricity, and telephone were separately identified (except for multifamily dwellings and dormitories where they were included in the rent) and set at levels comparable with those prevailing in the vicinity.

October 1951: Federal rent control was imposed on Richland.

October 1952: AEC filed a petition with the Office of Rent Stabilizatiton for rent increases.

January 1953: Rents were increased an average of 10 percent.

July 1953: Federal rent control expired.

October 1953: Rents were increased an average of 27 percent.

Rents and utility rates have remained substantially unchanged since that date.

Oak Ridge

September 1949: Rents were increased an average of 23 percent. Utility charges were separately identified (except for apartments and dormitories, where they were included in the rent) and brought to full comparability with those prevailing in the vicinity.

December 1951: Federal rent control was imposed on all dwellings built prior to February 1947.

March 1953, and September 1953. AEC filed petitions with the Office of Rent Stabilization for a 28 percent rent increase.

December 1953: Federal rent controls in Oak Ridge were removed.

February 1954: Oak Ridge rents were increased 28 percent.

Rents and utility rates have remained substantially unchanged since that date. A tabulation of house types, with rental ranges, follows:

Richland

SINGLE FAMILY

Number of units	Number of bedrooms	Number of stories	Baths per unit	Basement	Year built	Rent range	
						Per month	
27	4	1½	2	Yes	1944–48	$70 to $100	Concrete foundation; siding on exterior frame walls.
477	3	1	1	Yes	1944–48	$45 to $87.50	Do.
250	3	2	1	Yes	1944	$50 to $60	Do.
8	4	1½	1½	Yes	1944	$70 to $75	Do.
60	4	1	1	Yes	1952	$72.50 to $77.50	Do.
44	4	2	1½	Yes	1944	$57.50 to $62.50	Do.
25	2	1	1	Yes	1948	$70 to $74	Do.
146	3	1	1	Yes	1948	$80 to $90	Do.
110	2	1	1	No	1948	$42.50 to $50	Do.
1,290	3	1	1	No	1948	$47.50 to $62.50	Do.
50	4	1	1	No	1949	$67.50	Do.
1,276	1, 2, 3	1	1	No	[1] 1951	$24.45 to $38.90	Wood post foundation on concrete base; shingles or siding on frame walls.

TWO FAMILY

816	3	2	1	Yes	1944	$32.50 to $52.50	Concrete foundation; siding or shingles on frame walls.
1,040	2	1	1	Yes	1944	$27.50 to $47.50	Do.
170	2	1	1	Yes	1952	$57.50 to $62.50	Do.
10	2	1	1	No	1948	$42.50	Do.

MULTIFAMILY AND DORMITORIES

10	0, 1	2	1	No	1944	$50 to $75	Wood post foundation on concrete base; shingles or siding on frame walls.
64	1	1	1	Yes	1948	9$52.35 to $57.35	Concrete block exterior walls.
70	2	2	1	Yes	1951	$70	Concrete foundation. Siding on exterior frame walls.
702	------	2	------	No	1944	$17.50 to $27.50	Wood post foundation on concrete base; shingles or siding on frame walls.

Oak Ridge

SINGLE FAMILY

Number of units	Number of bedrooms	Number of stories	Baths per unit	Basement	Year built	Rent range	
1,538	2	1	1	No	1944	$39 to $65	Concrete foundation; exterior, cemesto board on wood frame.
739	3	1	1	No	1944	$42 to $88	Do.
170	3	1	2	No	1944	$70 to $85	Do.
300	2	1	1	No	1950	$61 to $64	Concrete block foundation and walls.
300	3	1	1	No	1951	$66 to $85	Concrete block or shingle on frame exterior walls.
72	4	1	1	No	1950	$75	Concrete foundation; frame exterior covered with shingles or siding.
13	3	2	1	No	1951	$79	Do.
10	4	2	1½	No	1951	$77 to $93	Do.
250	2	1	1	No	[1] 1953	$33 to $41	Foundation of wood posts on concrete footings; exterior frame walls covered with asbestos or wood shingles.
125	3	1	1	No	[1] 1953	$39 to $47	Do.
8	1, 2, 3	1	1	No	1944	$35 to $43	Do.

TWO FAMILY

120	2, 3	2	1	No	1944	$51 to $59	Concrete foundation; exterior walls, wood siding.
498	2	1	1	No	1950	$36 to $52	Concrete foundation; exterior walls, concrete block or shingles on frame.
106	3	1	1	No	1950	$58 to $61	Do.
380	2, 3	1	1	No	1951	$36 to $50	Foundation of wood posts on concrete footings; exterior frame walls covered with asbestos shingles or wood siding.
564	1, 2, 3	1	1	No	1944	$35 to $43	Do.

MULTIPLE HOUSING

576	1, 2	1, 2	1	No	1944	$47 to $57	Concrete foundation; exterior frame walls covered with wood siding or cemesto board.
200	1, 2	2	1	No	1944	$49 to $61	Do.
108	1, 2, 3	1	1	No	1944	$35 to $43	Foundation of wood posts on concrete footings. Exterior frame walls covered with asbestos or wood shingles.
113	1, 2	2	1	Yes	1944	$60 to $75	Concrete block exterior walls.
342	1, 2, 3	2, 3	1	Yes	1952	$62 to $80	Brick exterior walls.
453	1, 2	2, 3	1	Yes	1950	$83 to $94	Exterior walls, concrete block and redwood siding.
180	1	2	1	No	1944	$55	Concrete foundation; wood siding on exterior frame wall.
100	3	2	1	Yes	1951	$71 to $73	Exterior walls, brick and stuccoed frame.
846	------	2	------	No	1944	$14 to $33	Exterior walls, frame with siding or shingles.

[1] Rehabilitated.

7. Taxes Paid by Residents

Oak Ridge and Richland are under the political jurisdiction of the State in which each is located and the residents are subject to all ad valorem taxes paid by other residents of the State. These taxes would include such things as State sales taxes, personal property taxes, taxes on business, gasoline, cigarettes, etc.

TAXES ASSESSED TO OWNERS OF PROPERTY IN SURROUNDING COMMUNITIES

In Knoxville, Tenn., 25 miles from Oak Ridge, the municipal real property tax now in effect is levied at a rate of $2.64 per $100. The assessed value is approximately 50 percent of the true value, according to a report of the Tennessee Taxpayers' Association.

In Morristown, Tenn., about 50 miles from Oak Ridge, the municipal tax rate is $30 per $100, and the assessed valuation is approximately 35 percent of true value.

In Oak Ridge, the AEC has set a rate of $2.82 per $100, assuming assessed value at about 42 percent of true value, this rate to be charged private owners of real estate in the community.

In Pasco, Kennewick, and other communities near Richland, the State statutory limitation of 40 mills ($4 per $100) for combined municipal, county, and school taxes applies. The State of Washington requires this to be apportioned as follows: 15 mills for municipal, 14 mills for schools, and the remainder for the county or other special purposes. Assessed values range, on the average, from 19 to 25 percent of true value.

In Richland, the AEC has set rates, where applicable, at 15 mills ($1.50 per $100) for municipal, and 14 mills ($1.40 per $100) for schools. The Benton County assessor will establish the assessed value for property in Richland. We assume he will establish the assessed value as compared to full value within the range of 19 to 25 percent.

8. Payment of Services Provided to Tenants

Tenant and detached and duplex houses pay separately for utility services. Their rent, being equivalent to that paid to private landlords in the vicinity, is deemed to include an amount attributable to real property taxes which the landlord normally would pay for police, fire, and other municipal services. Individuals who have built their own homes on property leased from the AEC and merchants who have built their own buildings on leased property, pay a ground rent for the property which they lease, pay for utility services at prevailing rates, and in addition pay the equivalent of a property tax for municipal services.

As rental property now owned by AEC is sold, the purchasers will pay for utility services at prevailing rates, and will make tax-equivalent payments for municipal services.

As taxable value of real property is low in Oak Ridge and Richland, due to complete absence of industrial investment, underinvestment in commercial facilities, and low value of residential property, present standards of municipal service could not be supported with tax rates which compare with those in nearby communities. The deficit which would result from this condition measures the extent to which residents do not pay for municipal services.

6–9. INCOME AND OPERATION AND MAINTENANCE COSTS PERTAINING TO COMMUNITIES OF OAK RIDGE AND RICHLAND, FISCAL YEAR 1955

[In thousands of dollars]

	Income	Operation and maintenance costs [1]	Net [2]
OAK RIDGE			
Real estate:			
Housing	$5,186	$1,938	$3,248
Dormitories	198	171	27
Concessions and other rentals	1,083	347	736
Total	6,467	2,456	4,011
Utilities	1,923	1,151	772
Hospital	1,209	1,270	(61)
Municipal:			
Schools	346	2,501	(2,155)
Police and fire protection		456	(456)
Roads, streets, and grounds		136	(136)
Waste removal and sewerage		226	(226)
Civic activities	37	198	(161)
Tax-equivalent revenue	107		107
Other	16	404	(388)
Total	506	3,921	(3,415)
Total	10,105	8,798	1,307
RICHLAND			
Real estate:			
Housing	3,564	1,422	2,142
Dormitories	206	273	(67)
Concessions and other rentals	582	175	407
Total	4,352	1,870	2,482
Utilities	1,487	739	748
Hospital	719	988	(269)
Municipal:			
Schools		724	(724)
Police and fire protection	4	566	(562)
Roads, streets and grounds		149	(149)
Waste removal and sewerage	38	172	(134)
Civic activities	2	161	(159)
Tax-equivalent revenue	67		67
Other		244	(244)
Total	111	2,016	(1,905)
Total	6,669	5,613	1,056

[1] Excludes depreciation, equipment, and property disposal cost.
[2] Parentheses denote excess of operation and maintenance costs over income.

Mr. EVINS. As a member of the committee, I would like to state on the record that I trust the General Services Administration, the Housing and Home Finance Agency, and, most of all, the Atomic Energy Commission, will proceed with expedition in this disposal program, but at the same time protecting the Government's interest. I would want to add one further comment that I don't think there should be any aspersions as to the patriotism of any of the people in any of these communities. These employees at Oak Ridge are scientists, they are engineers, people from all over the country who have gone there to serve the Government—in many instances at personal sacrifice. I don't think they should be singled out for criticism or their patriotism held up to ridicule.

DECREASE IN PROSPECTIVE REVENUE AT OAK RIDGE

Mr. TABER. General, I am looking at page 124. Your prospective revenue from real estate at Oak Ridge dropped off practically $700,000

between the fiscal year 1955 and 1956. Does that reflect a substantial sale of real estate, or what is it?

Mr. FIELDS. That reflects——

Mr. TABER. If you do not know, ask some of your associates.

Mr. MCCARTHY. The budget reflects the initial disposal in the latter part of this fiscal year.

Mr. TABER. Have the disposals been made?

Mr. MCCARTHY. They have not, sir.

Mr. TABER. How could you set up anything like this, then, with such a thing as this coming up, the last month of the year, and reflecting a decrease in receipts like that?

Mr. MCCARTHY. At the time the budget was made up, it was estimated that the disposal program would get underway this spring. The appraisals have just now been made by FHA.

Mr. TABER. You have another drop of $2.3 million, almost 4, projected for next year. You are not going to get any such drop as that, are you?

Mr. MCCARTHY. It will, if the disposal sales at Oak Ridge move as fast as we expect. The question is as to how soon the disposal program will get underway.

Mr. TABER. There are no signs of life in the disposal program as yet.

Mr. MCCARTHY. I am sorry to say that it has not moved as fast as we expected.

Mr. TABER. I don't know. These tables don't seem to be worth anything.

Now we will go to the next one, the Richland deal. There does not seem to be any drop in 1956 to speak of, but when you get to 1957, there is a $2.5 million drop projected. There is no sale there, either.

Mr. MCCARTHY. No, not as yet. The appraisals there have been posted. I don't know whether we can meet our budgeted projection for disposals at Richland. We think we can.

Mr. TABER. In Los Alamos, there does not seem to be any projected sale.

Mr. MCCARTHY. The disposal program does not affect Los Alamos.

Mr. TABER. Now, turn back a minute and take a look at some of the items. You have a hospital on page 124, $1,208,000, and the next year $1,202,000, and the next year the same. How can you get figures of that kind?

Mr. PHILLIPS. You mean on Richland?

Mr. TABER. Yes, that is revenue estimates. How can you get figures of that character and have them run right along like that?

Mr. MCCARTHY. You will notice also the operating cost for the hospital remains pretty stable.

Mr. TABER. The same kind of table showing no change whatever.

Mr. MCCARTHY. We expect our experience will continue as it has for the last 2 years.

Mr. TABER. Here for utilities you do make a little bit there, up and down. Your municipal costs seem to drop off. You are doing better than the average city by itself.

Well, I guess that is all I have for the record now.

When you make up this table on the rents that are being charged, you ought to differentiate between the rents that are received from

temporary and from permanent housing, because if you do not, there would not be anything for us to go by.

Mr. FIELDS. We would also show dormitory rentals.

Mr. RABAUT. Do you have many business places that you rent there?

Mr. FIELDS. We do have, yes, sir.

Mr. RABAUT. Should they not be segregated?

Mr. FIELDS. They would undoubtedly have to be segregated. We would break it down by title of facility.

Mr. RABAUT. Before we get off this subject, I don't believe anybody here has had complaints about the management and care of the houses. All the talk I have heard about it is that the place has been well cared for, and so on. It is a matter of return to the Government that we are talking about. We don't want you to think that we are taking anything out on you about the running of the place. We think there is an improper return to the Government for a place that is as nice as it is.

Mr. FIELDS. You understand the reason for reflecting an increased cost to the Government in 1957 was the projection that the houses would be sold, a goodly number of them, about 50 percent of them in fiscal year 1957, and since they were sold we would not get revenue back in the form of rent. That was the reason for the change basically in the community operating budget to one of being a cost to the Government.

Mr. RABAUT. It is going to be accentuated for the next 5 years under the plan unfolded here today, because you are going to have less income and the continuing expense of maintenance.

Mr. FIELDS. That is true in accordance with the Community Disposal Act that was passed in 1955.

PROGRAM DIRECTION AND ADMINISTRATION

JUSTIFICATION OF THE ESTIMATE

Mr. CANNON. We will now take up "Program direction and administration." Turning to page 129, we will include in the record pages 1929 to page 1942 of the justification.

(The pages of the justification follow:)

PROGRAM DIRECTION AND ADMINISTRATION—OPERATING COSTS

Program statement

Estimate, fiscal year 1957	$39,427,000
Estimate, fiscal year 1956	38,016,000
Increase	1,411,000

The atomic-energy programs are directed by Commission employees budgeted under "Program direction and administration." The employees budgeted under this program are responsible for (1) negotiating production, research, construction, and other related contracts, (2) maintaining essential liaison with the contractors to assure protection of the Government's interest in contract performance, (3) developing standards and control measures for internal security and protection of Government funds and property, (4) licensing the peaceful uses of atomic energy, encouraging private civilian application and a program of cooperation with other nations, and (5) providing normal administrative services required for AEC personnel.

Program direction and administration activities are conducted through the Washington headquarters and the 10 operations offices with their 15 subordinate area offices. A few personnel are assigned to other locations where AEC business is conducted, but which do not carry the title or the full complement of personnel that would be assigned to an area or operations office. The cost of program direction and administration includes personal services, travel, and related supporting costs for office operation and maintenance.

The costs of program direction and administration in fiscal years 1956 and 1957 provide for continued all-out effort in the development, production, and stockpiling of atomic weapons for defense. Additionally, the estimated costs for these years reflect the emphasis of the Commission on the civilian application of atomic energy, the accelerated development of civilian and military reactors, and international cooperation. Costs of the Federal employees pay increase are reflected for the full fiscal year 1956. The relationship between administrative costs and operating costs decreases in fiscal year 1957 with program direction and administration representing only 2.3 percent of the total estimated operating costs as compared with 2.7 percent in fiscal year 1956 and 3.1 percent in fiscal year 1955.

Summary of estimates by category

Category	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
1. Personal services	$26,092,097	$29,222,000	$31,133,000
2. Travel	1,378,653	1,795,000	1,899,000
3. Other objects	5,535,139	6,485,000	5,953,000
4. Equipment not included in construction projects	947,519	514,000	442,000
Total, program direction and administration	33,953,408	38,016,000	39,427,000

JUSTIFICATION OF CATEGORIES

1. Personal services, $31,133,000

Program direction and administrative service functions are provided by an average permanent staff of approximately 4,600 full-time AEC employees in fiscal year 1957, augmented by a small number of professional and scientific consultants whose services are available only for limited periods. Requirements for personal services costs are tabulated as follows:

	Fiscal year 1956	Fiscal year 1957
(*a*) Net cost of permanent employees	$28,619,000	$30,648,000
(*b*) Other positions	144,000	142,000
(*c*) Regular pay in excess of 52-week base	110,000	0
(*d*) Payments above basic rates	337,000	333,000
(*e*) Reimbursements to other agencies	12,000	10,000
Total personal services	29,222,000	31,133,000

The details of the estimate are as follows:

(*a*) *Net cost of permanent employees, fiscal year 1956, $28,619,000; fiscal year 1957, $30,648,000.*—Starting and ending employment for fiscal years 1956 and 1957 is related to average employment and other factors on the following table. The net cost of permanent employees is based on estimated costs for average employment plus costs of terminal leave payments.

	Fiscal year 1956	Fiscal year 1957
I. Employment:		
(a) Starting employment	4,189	4,494
(b) Ending employment	4,494	4,755
(c) Average employment	4,358	4,624
II. Terminal leave:		
(a) Add terminal leave (man-year equivalent)	35.5	34.7
(b) Net permanent man-years	4,353.5	4,658.7
III. Average man-year cost	$6,514	$6,580
IV. Net cost of permanent employees (line II (b) multiplied by line III)	28,619,000	30,648,000

Factor I, employment, is based on the actual starting employment of 4,189 at the beginning of fiscal year 1956, a projected employment at the end of fiscal year 1956 of 4,494 and a projected employment at the end of fiscal year 1957 of 4,755. The average employment of 4,358 in fiscal year 1956 and 4,624 in fiscal year 1957 reflects the impact of accelerated civilian and military reactor development programs, the civilian application program involving all but the more highly classified facilities of the Commission and the international cooperation program. Employment projections for fiscal years 1956 and 1957 reflect demands from the public, holders of access agreements, licensees and prospective licensees for scientific and technical assistance, interpretation of regulations, personnel security clearances and physical security inspections. Additional requirements for personnel in fiscal year 1957 are partially offset in the estimate by the proposed reduction of 50 employees at Hanford, Oak Ridge and Savannah River Operations Offices related to the completion of major construction.

Factor II, terminal leave, includes man-year equivalents for persons who when separated draw terminal leave payments from the Commission, although no longer working for AEC. The estimate is slightly under 1 percent of average employment and is based on experience of the agency in prior years.

Factor III, average man-year cost, reflects an increase in the average cost per employee of $66 in fiscal year 1957. The primary cause for this increase is automatic within-grade advancements.

The distribution of permanent civilian employment under program direction and administration is tabulated below:

Operations office location	Employment		
	June 30, 1955	June 30, 1956	June 30, 1957
Grand Junction Operations Office, Grand Junction, Colo	145	162	169
Hanford Operations Office, Richland, Wash	294	276	256
Oak Ridge Operations Office, Oak Ridge, Tenn	839	831	806
Savannah River Operations Office, Augusta, Ga	235	235	230
Albuquerque Operations Office, Albuquerque, N. Mex	676	710	722
San Francisco Operations Office, Oakland, Calif	111	114	138
Chicago Operations Office, Lemont, Ill	272	304	341
Idaho Operations Office, Idaho Falls, Idaho	88	94	131
Schenectady Operations Office, Schenectady, N. Y	67	77	84
New York Operations Office, New York, N. Y	129	140	160
Total field	2,856	2,943	3,037
Washington headquarters and extensions	1,333	1,551	1,718
Total permanent civilian employment	4,189	4,494	4,755

The primary reasons for changes in strength of individual offices during 1957 are as follows:

Grand Junction ..... +7

Personnel increases will be required for the Finance, Mining, and Processing Divisions due to increased concentrate and ore production activity and the attendant finance audit activities resulting from new concentrate contracts. This is an extension of the growth experienced in fiscal year 1956.

Hanford ---------- —20

Completion of major construction, decline in procurement activities, and reduced workloads in other administrative activities will result in reduced employment in the Security, Finance, Administrative, and Engineering and Constructon Divisions.

Oak Ridge ---------- —25

Completion of major construction will result in reductions in this and related activities at Portsmouth, Paducah, and the Oak Ridge construction area.

Savannah River ---------- —5

Completion of transition from the construction phase to the operations phase makes possible further reductions in 1957 to the level contemplated for permanent operations.

Albuquerque ---------- +12

This increase is required for expanded reactor development and weapons testing activities under the Albuquerque Operations Office.

San Francisco ---------- +24

This increase is required for expanded reactor development and weapons programs under the San Francisco Operations Office.

Chicago ---------- +37

The further acceleration of military and civilian reactor development at Pittsburgh, Lockland, Ohio, and East Hartford, Conn., together with the impact of the civilian application program on the Chicago area generates need for these additional personnel.

Idaho ---------- +37

These requirements are related to a sharply increased construction program, expanded reactor development testing activities, and the reactor safety program.

Schenectady ---------- +7

Additional personnel will be required due to increased contract activity, anticipated acceleration in the industrial participation program and for supporting services in connection with the military reactor projects.

New York ---------- +20

Additional personnel are required in connection with the construction program and the large number of access permits assigned to the New York Operations Office.

Washington ---------- +167

The organization of the Washington Headquarters has been augmented and strengthened, primarily, in the reactor development, civilian application and international cooperation areas. A Division of Civilian Application is established to centralize all functions related to the development and issuance of regulations and standards; licensing use of source, special nuclear, byproducts, and other materials, administering export controls previously in the Division of Construction and Supply, and related functions. The Division of International Affairs is enlarged to encompass the administration of bilateral agreements, relationships with the United Nations, and other responsibilities under the international cooperation program.

Requirements for additional personnel in the Washington headquarters and extensions are detailed by division as follows:

	Year-end strength		
	Fiscal year 1956	Fiscal year 1957	Increase
Office of the General Manager Required due to the increased industrial interest in atomic energy.	60	61	1
International Affairs Implementation of the atoms for peace program.	70	112	42
Inspection Primarily due to increase in compliance activities under the civilian application program.	26	31	5
Civilian Application Handling expanding access permit and licensing programs, development of reactor safety standards, and review of safety aspects of engineering designs of individual civilian power and research reactors.	85	115	30
Organization and Personnel 3 are needed for the incentive awards and employee training programs and problems of relocating the Washington office and 2 will be required to support the Atomic Energy Labor-Management Relations Panel which is being transferred from the Federal Mediation and Conciliation Service.	70	75	5
Classification and Oak Ridge Extension Required in connection with the declassification program in order to make scientific data more readily available for civilian applications of atomic energy.	30	32	2
Information Services and Oak Ridge Extension Dissemination of scientific and technical information required in support of the civilian application and atoms for peace programs.	211	231	20
Nuclear Materials Management Related to production increases and industrial participation problems.	23	27	4
Production Required for civilian application responsibilities of this Division.	69	71	2
Reactor Development Direction of expanding military and civilian reactor development programs and carrying out responsibilities in connection with civilian application and atoms for peace programs.	110	145	35
Biology and Medicine Implementation of the atoms for peace program in the fields of biology and medicine and strengthening of the staff to cope effectively with expanding demands in the research field.	62	70	8
Research Scientific and technical personnel for Project Sherwood and research activities in the fields of high temperature chemistry and metallurgy, and high energy physics.	33	38	5
Military Application To handle expanded weapons program.	44	52	8

	Fiscal year 1956	Fiscal year 1957
(*b*) Other positions	$144,000	$142,000
Man-years of part-time and WAE employment	15.6	15.3
Includes members of the General Advisory Committee, the Patent Compensation Board, members of other boards, committees, and panels and other experts and consultants in the Commission who are paid only when employed. The estimate for fiscal year 1957 is based on fiscal year 1955 and fiscal year 1956 experience.		
(*c*) Regular pay in excess of 52-week base	$110,000	0
Compensation of permanent employees requires funding for extra days of pay when more than 260 days of pay occur in 1 fiscal year. 1 extra day of pay is budgeted for 1956. No funds are required for this purpose for 1957.		
(*d*) Payment above basic rates	$337,000	$333,000
This provides for scheduled and emergency overtime, night-work differential, and living and quarters allowance for AEC employees stationed overseas. The fiscal year 1957 estimate is based on fiscal year 1955 and fiscal year 1956 experience.		
(*e*) Reimbursement to other agencies	$12,000	$10,000
Department of State is reimbursed for furnishing secretarial service to the Johannesburg, South Africa, office and the Civil Service Commission furnishes testing services to the Sante Fe office.		

2. Travel, $1,899,000

Commission personnel assigned to program direction and administration travel to laboratory, production, testing and storage facilities for administration of contracts, to work with the contractors and field offices in new scientific and production developments and to inspect and audit for compliance with standards established for internal security, personnel, property and funds. The estimated travel costs by office for fiscal year 1956 and fiscal year 1957, and the primary reasons for the increased costs anticipated for fiscal year 1957 are set forth by office below:

Office and location	Fiscal year 1956		Fiscal year 1957	
	Days of travel	Cost	Days of travel	Cost
Grand Junction Operations Office, Grand Junction, Colo	5,964	$90,000	6,595	$98,000
Hanford Operations Office, Richland, Wash	1,228	46,000	1,244	46,000
Oak Ridge Operations Office, Oak Ridge, Tenn	7,204	187,000	7,165	187,000
Savannah River Operations Office, Augusta, Ga	2,150	64,000	2,150	64,000
Albuquerque Operations Office, Albuquerque, N. Mex	13,658	370,000	13,837	370,000
San Francisco Operations Office, Oakland, Calif	1,389	47,000	1,389	47,000
Chicago Operations Office, Lemont, Ill	3,613	124,000	4,128	140,000
Idaho Operations Office, Idaho Falls, Idaho	1,402	58,000	1,402	58,000
Schenectady Operations Office, Schenectady, N. Y	1,088	37,000	1,088	37,000
New York Operations Office, New York, N. Y	1,196	32,000	1,196	32,000
Total field	38,892	1,055,000	40,194	1,079,000
Washington headquarters, Washington, D. C., and extensions, Oak Ridge, Tenn	21,600	740,000	24,031	820,000
Total, travel	60,492	1,795,000	64,225	1,899,000

The primary reasons for increases in travel costs anticipated for fiscal year 1957 are summarized below by operations office and Washington division:

Grand Junction Operations Office $8,000

Expansion of the raw materials procurement program will increase the travel requirements of the Mining, Processing, and Finance Divisions.

Chicago Operations Office $16,000

Expansion of the military and civilian reactor programs will increase the travel requirements of the three area offices located at Lockland, Ohio; Pittsburgh, Pa.; and Hartford, Conn.

Washington headquarters $80,000

Continued expansion in the areas of civilian application, industrial participation, international cooperation is primarily responsible for the increased requirements for this office. A comparison of the estimated costs for the divisions affected by this expansion is detailed below.

	Travel cost		
	Fiscal year 1956	Fiscal year 1957	Increase
Civilian application	$10,000	$15,000	$5,000
More extensive travel in connection with an anticipated increase in the number of license applications for power and research reactors.			
Inspection	40,000	54,000	14,000
Increased travel related to civilian application program compliance activities and the first full year travel costs for other inspection functions.			
International affairs	31,000	49,000	18,000
Increased costs result from increased staff in 1957.			
Reactor development	112,000	130,000	18,000
Increased travel will be required primarily for the Naval Reactors Branch in connection with expanding projects which have progressed to the contract design phase and in connection with the design phase of the new project at Bettis Plant.			
Other increases			25,000
Increased travel funds will be required for the estimated travel requirements of all Commissioner positions, for field reviews of new program developments by the staff of the Divisions of Military Application, Research and Biology and Medicine, and for travel of the Atomic Energy Labor—Management Relations Panel which is being transferred from the Federal Mediation and Conciliation Service.			

3. Other objects, $5,953,000

Funds requested are to cover the cost to AEC for communications, rents, utilities, supplies, maintenance, and other services for the 10 operations offices, 15 area offices, and the Washington headquarters. Also included in this request are supplies and services required for the Technical Information Service printing and reference facility at the Washington headquarters extension and the contractual cost of operating the American Museum of Atomic Energy and its traveling exhibits under the Oak Ridge, Tenn., office.

Costs chargeable to program direction and administration for these objects for fiscal years 1956 and 1957 are expected to exceed those experienced in fiscal year 1955, such increases being consistent with the areas of program expansion evidenced by the personal services and travel requirements. The decrease in fiscal year 1957 reflects the deletion of Washington office rental costs budgeted by the General Services Administration for that year. Estimated requirements, by office, are indicated on the following page.

Office and location	Fiscal year 1956	Fiscal year 1957
Grand Junction Operations Office, Grand Junction, Colo	$225,000	$230,000
Hanford Operations Office, Richland, Wash	377,000	375,000
Oak Ridge Operations Office, Oak Ridge, Tenn	1,318,000	1,323,000
Savannah River Operations Office, Augusta, Ga	315,000	314,000
Albuquerque Operations Office, Albuquerque, New Mex	778,000	747,000
San Francisco Operations Office, Oakland, Calif	160,000	170,000
Chicago Operations Office, Lemont, Ill	315,000	330,000
Idaho Operations Office, Idaho Falls, Idaho	196,000	174,000
Schenectady Operations Office, Schenectady, N. Y	55,000	55,000
New York Operations Office, New York, N. Y	222,000	222,000
Total field	3,961,000	3,940,000
Washington headquarters, Washington, D. C., and extensions, Oak Ridge, Tenn	2,524,000	2,013,000
Total, other objects	6,485,000	5,953,000

Principal changes, other than those related to personnel, are:

Albuquerque Operations Office.—Nonrecurrence of fiscal year 1956 costs for rearrangement of office space at Kansas City, movement of the Los Alamos AEC staff, and other service costs, amounting to $31,000.

Idaho Operations Office.—Nonrecurrence of office maintenance and repair costs scheduled for fiscal year 1956, amounting to $22,000.

Washington Headquarters.—Beginning with the fiscal year 1957, the rental costs for office space at the 1717 H Street building will not be included in this budget but will be provided for in the budget of the General Services Administration, resulting in a decrease of $551,000 from fiscal year 1956 for this item.

4. Equipment not included in construction projects, $442,000

This estimate provides for the addition and normal replacement of AEC administrative equipment in the motor vehicles, office furniture and machines, and miscellaneous categories. Fiscal year 1957 requirements by categories are as follows:

Motor vehicles	$82,200
Office furniture and machines	313,000
Miscellaneous	46,800
Total	442,000

The fiscal year 1957 estimate of $442,000 is $72,000 less than that required during fiscal year 1956. Amounts estimated for replacements and additions are:

Replacements	$114,625
Additions	327,375

GENERAL STATEMENT

Mr. CANNON. I will ask General Fields for a statement on the program.

Mr. FIELDS. Mr. Chairman, this program provides for program direction and administration of the Commission's program. It is concerned largely with employees employed directly by the Commission. This activity relates to the general direction of the total program, including the negotiation and administration of contracts; the control of programs from the technical standpoint; the development of standards and controls on contracts; security control; the control of Government funds and property; and normal administrative services. We are asking for an increase of $1.4 million for this program in 1957 due to requirements for additional employees.

With the passage of the Atomic Energy Act of 1954, the Commission did receive new responsibilities in the program under civilian application. We have increased development activities in our own

program; undertake new programs of licensing and regulation, the issuance of these, including the issuance of license, the supervision and inspection of licensees. We also have the new program for cooperation with foreign countries. Additionally, we have to administer the increased procurement of raw materials.

These new responsibilities have been placed upon us, and we need additional personnel to carry out those responsibilities. That is the reason for the $1.4 million increase in our request for personnel.

The amount requested would provide for a year-end strength of 4,755 people, and an average employment of 4,624 for this program. This includes personnel in our Washington headquarters and in our field operations offices. There are 10 principal offices, with 15 field offices under them, which are, staffed by Government employees engaged in the supervision of the programs and contract activities.

Mr. CANNON. Have you during the year shifted any personnel from this activity to any other part of your work? Or have you shifted from this program any expense in connection with its administration in the last year to that of some other program under your jurisdiction?

Mr. MCCARTHY. Mr. Chairman, I am not aware of any. In 1956 we made no reclassification of personnel.

Mr. CANNON. There was no shift of personnel or expense from this program to any other program?

Mr. MCCARTHY. No, sir.

CONSOLIDATION OF MOTOR POOLS

Mr. CANNON. I note that you have one operations office, and in that connection for motor pools are being operated. The Grand Junction Operations Office has the Exploratory Division, the Mining Division, Geological Survey. All of these are doing Atomic Energy Commission work exclusively, as I understand.

Mr. FIELDS. Yes, sir.

Mr. CANNON. Why would it not be a matter of economy to operate all as one motor pool?

Mr. FIELDS. I will ask the Controller, Mr. Burrows, to answer this question?

Mr. BURROWS. There is a misconception as to what constitutes a motor pool, but we have consolidated 3 of these and operate under 1 series of dispatches. The other is operated by the Geological Survey, which is a separate Government agency operating under its own account.

Mr. CANNON. But it is doing AEC work exclusively?

Mr. BURROWS. That is correct, but it operates under its own system. Actually what happens is that most of these cars located in Grand Junction, a great deal of the time, are used out in the field. As a result, they are assigned to geologists and engineers who spend a good deal of their time on the road, inspecting installations. We have made the change since that comment was made to you, sir. There is now a common dispatcher for the cars while they are at Grand Junction.

Mr. CANNON. In 1954, the General Accounting Office called the attention of the AEC to the maintenance of these individual pools, and at that time suggested—or at least inquired why—they were not

consolidated. Was any action taken as a result of the recommendation of the General Accounting Office?

Mr. BURROWS. Yes, sir; so far as the three pools that are immediately under our control, sir.

Mr. CANNON. You do not think it would be advantageous to operate one general pool?

Mr. BURROWS. We do, insofar as the automobiles under our control, sir.

Mr. CANNON. Isn't everything dealing exclusively with your work under your control?

Mr. BURROWS. The Geological Survey is a separate Government agency.

Mr. CANNON. But it works for you exclusively. Why should you not have the direction of its motor pool?

Mr. BURROWS. It does its own work, too. They merely have a contract with us to do certain surveys for us.

Mr. CANNON. I notice also that at the Grand Junction Operations Office, there are four warehouses, each of which stocks items of a like nature. Why wouldn't one general warehouse, or at least warehouses which do not duplicate items handled by the other warehouses, be practical?

Mr. BURROWS. We have taken action on this recommendation, too, sir, except for what you might call working stocks which are not necessarily in warehouses.

Mr. CANNON. The General Accounting Office also referred to this in 1954.

Mr. BURROWS. Yes, sir.

Mr. CANNON. What amendment did you make?

Mr. BURROWS. We took action to screen out all common stocks which were in excess of day-to-day working supplies and brought them back into the common warehouse, sir.

Mr. CANNON. You are still giving service in the four warehouses, aren't you? Don't you have the same items in each of the warehouses?

Mr. BURROWS. Not at the present time, sir. We have screened out all common stocks.

Mr. CANNON. The Brookhaven area office, and that is operated by the Associated Universities, and it is very near New York, I believe 75 miles from New York, comes under the New York Operations Office. Why is it necessary that this office have 24 employees, whereas Paducah has only 23? What functions are the AEC personnel performing that could not be performed by the New York office? That is another item that the General Accounting Office called to your attention some time ago.

Mr. FIELDS. As I understand, the staffing in fiscal year 1956 is 18 persons for that office. It is an area office necessary for administration of the Brookhaven contract and is maintained because of the magnitude of that contract and the distance of the site from New York. It is a very active laboratory and a great variety of work is going on there, including civilian unclassified research.

Mr. CANNON. The personnel out there is principally or perhaps exclusively administrative. Is that true of the New York office also?

Mr. FIELDS. That is true of the New York office also.

Mr. CANNON. Isn't that a duplication?

Mr. FIELDS. It is the same type of work. They do not both perform the same work for this same organization. They handle security

clearances and administration of security at that site and the administration of the contract which would not be done in the New York office. There is also administration of construction work at Brookhaven, including the construction of a very large high energy accelerator, which is supervised locally. For these reasons we feel we should continue with the staff at the site.

INCREASE FOR PERSONAL SERVICES

Mr. CANNON. Last year you estimated your personnel services at $26,330,000 for fiscal year 1956. This year your estimate for the fiscal year 1956 is $29,222,000. That is a substantial increase. Is there any occasion for it beyond the fact that you are expanding your current programs?

Mr. MCCARTHY. One of the main items, Mr. Chairman, was the pay raise voted by Congress. Our 1956 budget did not reflect that.

Mr. CANNON. How much of that is accounted for by the statutory increase in pay?

Mr. MCCARTHY. Roughly $2 million.

Mr. CANNON. That would leave an increase really of only $892,000.

Mr. MCCARTHY. That is correct.

Mr. CANNON. Also last year you predicted for fiscal 1956 employment would drop. You said at that time you expected to reduce employment from 4,322 to 4,268. Instead of making that drop, you now propose a rise to 4,494. Is that due to a change of policy in the meantime? Instead of a decrease which you promised us a year ago, you are now asking us for an increase?

Mr. FIELDS. This is due to the impact of the increase in size of the programs for civilian application which I referred to, the new program for international cooperation, and to the licensing and regulatory functions that have resulted from the passage of the Atomic Energy Act of 1954. Apparently we did not fully appreciate the impact of these requirements a year ago. The regulatory aspect, in itself, will require a considerable number of people.

Mr. CANNON. Bringing this down specifically and taking the Washington employees as example. In 1954, your Washington employees were 42 percent of your field employees. In 1955, they were 46 percent. Last year you estimated they would be 47 percent in 1956. Now you are estimating them at 54 percent. You estimate that in 1957 they will be 56 percent. Do you expect this trend to continue?

Mr. FIELDS. I would hope not, sir. I would hope that with the personnel we have projected here we could meet the programs as we see them now. We have been growing this last year. I am not sure that we have reached the end of our growth. The impact has been felt in Washington more than any other location because the new activities, the relations with industry, the civilian application program, the licensing and regulation programs have required an increase in staff in the Washington headquarters. I don't like the growth in the central headquarters as it is now occurring. I hope we can stop any further growth.

Mr. CANNON. There seems to be a disposition here to put this additional emphasis on the headquarters. For instance, your amended justifications increase the field personnel by 127, and your Washington headquarters by 133. That means the headquarters increase is the larger. What can you say as to this headquarters increase?

Mr. FIELDS. The headquarters increase is for particular activities which entail the formation of two new divisions in our headquarters, that is, a Division of International Affairs, and a Division of Civilian Application. The Division of International Affairs is responsible for the negotiation of agreements of cooperation with foreign countries. As you recall, our Chairman indicated there have been 30 such agreements negotiated this past year. This Division will also be responsible for the implementation of those agreements, and will handle all the activities entailed in the implementation of the agreements with foreign countries.

The second division, the Division of Civilian Applications, is a new Division required to conduct the licensing and regulatory function now required of us and with the increased industrial activity in this country their workload will continue to increase. The Divison has a very heavy responsibility in connection with insuring the safety of our whole population by regulation and licensing, and by inspection of facilities such as reactors.

So we must provide for the increasing demands placed upon us in this growing civilian application program. These have led to the fact that the Washington headquarters itself has to grow even more than the combined field offices.

Mr. CANNON. You do not give us what seems to be essential information on international affairs. For example, you say the strength of the Division of International Affairs will be 112, but you say nothing about its size of operations. You give us no information as to what the 112 will enable it to do that it is not doing today. You say it will be 112, but you don't say what its present size will be or what its operation will entail.

Mr. FIELDS. As of March 31 of this year the employment was 57. I don't have the strength as of today. Seventy is the target for the end of this fiscal year for that Division.

Mr. CANNON. Are you certain about that?

Mr. FIELDS. No; I am not certain.

Mr. CANNON. It does not seem logical.

Mr. FIELDS. I will try to get you the strengths.

Mr. CANNON. Suppose you supplement your testimony on that.

(NOTE: The number of personnel assigned to the Headquarters Division of International Affairs on June 15, 1956, was 59. The number estimated to be assigned as of June 30, 1956, is 62.)

OTHER OBJECTS

Mr. CANNON. Now, when it comes to "Other objects," why did your estimate go up this year over a million dollars in excess of what you thought would be necessary when you were here last year? Last year the estimate for the fiscal year 1956 was $5,212,000, as contrasted with the present estimate of $6,485,000.

Mr. MCCARTHY. The large increase, Mr. Chairman, was due to the need to print for the first time a number of classified technical publications in order to make them available for access permit holders.

Mr. CANNON. How does it happen you did not have them previously?

Mr. MCCARTHY. At the time we prepared our initial 1956 budget, we did not have any indication as to what the impact would be. Furthermore, we had to undertake a large declassification program last fall to get this information in the hands of access permit holders.

Mr. CANNON. Going a little further into the matter, I note you make the statement that a part of $70,000 will be spent for trucks and special equipment for use in showing atomic energy exhibits. That is in the original justification you sent us.

Mr. MCCARTHY. These are for the exhibits traveling throughout the country.

Mr. CANNON. That program has not been materially changed either in extent or amount?

Mr. MCCARTHY. In 1957 it is proposed that it be enlarged. There will be more exhibits as we have more demand for the exhibits by cities, fairs, and other organizations who are asking that they be exhibited to the people.

Mr. CANNON. You think they secure worthwhile results, that the effect on those who see them will justify the expenditure?

Mr. MCCARTHY. They are in very great demand and certainly we have had a lot of commendation for getting this material to the public. I think the Geneva Conference exhibits have stirred a lot of interest.

Mr. CANNON. Mr. Rabaut?

Mr. RABAUT. These are specially built trucks?

Mr. MCCARTHY. They are trailer trucks with the panel exhibits on them and can be taken to a city or to a hall and unloaded and placed.

Mr. RABAUT. How many trucks are involved?

Mr. MCCARTHY. There will be eight trucks.

Mr. PHILLIPS. Mr. McCarthy, how much did you say we spent in the current year for this printing bill.

Mr. MCCARTHY. As I recall the total was about a half million dollars. There were quite a number of reports which were declassified last fall.

Mr. PHILLIPS. I thought you said more than that.

Mr. MCCARTHY. I might also say, Mr. Phillips, that one of the reasons was that a number that were declassified went to the Government Printing Office.

Mr. PHILLIPS. Do you sell some of these?

Mr. MCCARTHY. Those are sold by the Superintendent of Documents. The return does not come to us. We have to pay for the printing.

Mr. PHILLIPS. What is the net cost to the United States?

Mr. MCCARTHY. I am not sure I know what their income has been from the sale of those documents. We can probably find out.

Mr. PHILLIPS. I notice on page 147, we have in 1955 an actual cost of a million dollars for the Geneva Conference and then again in 1956. When was the conference held?

Mr. MCCARTHY. It was held last August. There are still some bills coming in.

Mr. PHILLIPS. There is $821,000. That is $1,821,000.

Mr. MCCARTHY. Total cost.

Mr. PHILLIPS. That is a lot of money. Did you buy a hotel or something?

Mr. MCCARTHY. If you will recall, roughly $800,000 of this went for the swimming pool reactor, which was the main center of attraction in the United States exhibit. It in turn was sold to the Swiss Government.

Mr. PHILLIPS. How much did you get from that?

Mr. FIELDS. About $300,000, as I recall. I can supply the exact figure.

Note.—The amount realized from the sale of the reactor was $181,982.

Mr. PHILLIPS. Why could you not do better than that?

Mr. FIELDS. We offered it to them at a figure which was estimated to be the fair salvage value. We could make no use of it in Switzerland. We would have had to bring it back. On that basis we arrived at a figure at which it was offered for sale, and they took it at that figure, sir.

Mr. PHILLIPS. That is all, Mr. Chairman.

Mr. CANNON. Mr. Jensen.

Mr. JENSEN. No.

Mr. CANNON. The committee will stand adjourned until Monday at 10 o'clock.

MONDAY, JUNE 18, 1956.

Mr. CANNON. The committee will come to order.

SECURITY INVESTIGATIONS PROGRAM

JUSTIFICATION OF THE ESTIMATES

Resuming our hearing on the Atomic Energy Commission budget, we will turn to the security investigations program, and we will include at this point the justifications on page 143 through and including 146.

(The pages of the justification follow:)

SECURITY INVESTIGATIONS PROGRAM—OPERATING COSTS

Program statement

Estimate fiscal year 1957	$6, 610, 000
Estimate fiscal year 1956	6, 807, 000
Decrease	197, 000

This program includes the cost of security investigations of individuals as required under the Atomic Energy Act of 1954 except for licensee applicants and others for whom security clearances are required under the civilian application program, which are budgeted under "Other costs." The act of 1954 provides that no individual shall be permitted to have access to restricted data until the United States Civil Service Commission or, under certain conditions, the Federal Bureau of Investigation shall have made an investigation and report to AEC on the character, associations and loyalty of such individual and the AEC shall have determined that permitting such person to have access to restricted data will not endanger the common defense and security.

Published policies and standards provide guidance in determining need for AEC security clearance.

Reduction in estimated costs, fiscal year 1956 and fiscal year 1957 as compared with fiscal year 1955, is attributable to two features of the Atomic Energy Act of 1954 which:

(*a*) Authorize use of national agency checks (costing $4.20 each) in lieu of full field investigations (averaging $245 each) as the basis for an "L" clearance permitting access to civilian-use information classified not higher than confidential or restricted data.

(*b*) Relieve AEC from responsibility for investigating and clearing large numbers of personnel of the Department of Defense whose official duties require access to restricted data of the atomic energy program.

Clearance needs of AEC contractors account for approximately 80 percent of the security investigations budgeted for fiscal year 1957. The remaining 20 percent of investigations are required for clearance of AEC employes (5 percent),

reinvestigations of persons previously cleared (7 percent) and clearances of others, including suppliers and employees of other agencies (8 percent).

Pursuant to provisions of section 145 (e) of the Atomic Energy Act of 1954, distribution of total investigative caseload between USCSC and FBI is based on Commission-approved criteria. Investigations of personnel for positions of a high degree of importance or sensitivity are referred to the FBI and all others are referred to the United States Civil Service Commission.

The number of new cases referred to the investigating agencies, number of cases in process, and number of cases estimated to be completed are shown on the following table for full background "Q" investigations and national agency "L" checks. Completed cases reflect costs by applying the unit cost per case for each investigative agency. Unit costs are based on experience of the Federal Bureau of Investigation and the Civil Service Commission.

Summary of estimates

	Actual, fiscal year 1955		Estimate, fiscal year 1956		Estimate, fiscal year 1957	
	Q	L	Q	L	Q	L
1. Number of new cases referred to investigative agency:						
FBI	16,628	.....	7,500	.....	6,000	.....
CSC	22,755	3,679	20,500	7,000	21,000	5,000
Total	39,383	3,679	28,000	7,000	27,000	5,000
2. Number of cases in process at end of year in investigating agency:						
FBI	2,140	.....	1,140	.....	990	.....
CSC	2,264	277	3,264	400	3,264	300
Total	4,404	277	4,404	400	4,254	300
3. Cases completed during year:						
FBI	20,639	.....	8,500	.....	6,150	.....
CSC	24,279	3,402	19,500	6,877	21,000	5,100
Total	44,918	3,402	28,000	6,877	27,150	5,100
4. Cost of completed investigations:						
Q clearances:						
Number completed by FBI	20,639	.....	8,500	.....	6,150	.....
Cost per investigation	$207.38	.....	$235	.....	$235	.....
Total cost, FBI	$4,280,017	.....	$2,000,000	.....	$1,444,000	.....
Number completed by CSC	24,279	.....	19,500	.....	21,000	.....
Cost per investigation	$227.53	.....	$245	.....	$245	.....
Total cost, CSC	$5,524,146	.....	$4,778,000	.....	$5,145,000	.....
Total cost, Q clearances	$9,804,163	.....	$6,778,000	.....	$6,589,000	.....
L clearances:						
Number completed by CSC	.....	3,402	.....	6,877	.....	5,100
Cost per investigation	.....	$3.90	.....	$4.20	.....	$4.20
Total, L clearance (CSC)	.....	$13,268	.....	$29,000	.....	$21,000
Total, security investigations program	$9,817,431		$6,807,000		$6,610,000	

GENERAL STATEMENT

Mr. CANNON. We shall be glad to have a statement on this program, General Fields.

Mr. FIELDS. This program includes the cost of security investigations of individuals as required under the Atomic Energy Act of 1954, and includes all personnel background investigations required by that act. There is a slight decrease forecast in this category for the forthcoming year due to reduction in number of full field investi-

gations and L clearances. This decrease is possible because the number of facilities operated is more stabilized than it has been in the past.

In addition there is continued use of the authority provided in the act of 1954 to use national agency checks in lieu of the more costly full field investigations for personnel requiring access to less sensitive categories of restricted data.

Mr. CANNON. You say it is less expensive. Is it as effective?

Mr. FIELDS. Yes, sir; it is just as effective.

By the act of 1954, there are certain categories of information of lower classification, but still classified, for which the investigative requirements have been reduced. This applies to information of a confidential category only. For access to information classified as secret and higher, the full field investigation is still required.

This forecast shows that approximately the same level of clearances will be required with a slight reduction in the overall cost for fiscal year 1957. Background investigations are made by the Federal Bureau of Investigation or by the Civil Service Commission, depending upon the type of investigation involved.

REINVESTIGATIONS

Mr. CANNON. Is the situation such, General Fields, that you consider it necessary after you have made an initial investigation and have cleared the subject, to keep constantly in touch with him? I notice here that an appreciable amount of your work is reinvestigation, and it seems to me reduced to statistics that 7 percent of your work is an investigation of subjects previously cleared. Is that duplication or have you found that necessary? Have you in any of these cases of reinvestigation found your first report was erroneous, or that there has been some defection since your first investigation?

Mr. FIELDS. The reinvestigation program, sir, is directed largely at those persons who occupy the most sensitive positions; that is, where they have access to the most highly classified information.

Mr. CANNON. Is your determination to reinvestigate made only on sufficient evidence that there is occasion for it, or is it merely routine that those in more sensitive positions be constantly reinvestigated?

Mr. FIELDS. It is largely the latter. On a periodic basis those occupying the most sensitive positions are reinvestigated. There are instances, however, when any information of a derogatory nature develops, subsequent to a clearance, then there is a further investigation with respect to that information.

Mr. CANNON. Have you in any instance on reinvestigation found your first report erroneous?

Mr. FIELDS. I cannot answer that at the moment, sir. I would have to supply that for the record. I am not aware of any, myself.

Mr. CANNON. I will be glad for you to do that.

(The information is as follows:)

There have been no instances where the first report was found to be erroneous.

The following categories of personnel engaged in AEC work are reinvestigated automatically 5 years after their last previous investigation:

1. All AEC employees.
2. All contractor employees having access to top secret information.
3. All contractor employees having responsibility for formulating broad policy or for program direction in the weapons program or military reactor program.

4. Others whose files or new questionnaires contain information requiring clarification.

Of the 15,229 reinvestigations conducted to date, 192 cases have been found to contain substantially derogatory information as defined in the AEC criteria. These 192 cases have been processed in accordance with standard procedures. In 7 cases clearance has been revoked and in 14 other cases the individual resigned during the proceedings.

Mr. CANNON. Do you, as a matter of policy, keep those in the more sensitive positions under surveillance?

Mr. FIELDS. No, sir; not in the sense that I believe you are using the word. We do not have people checking up in the sense of surveillance on those working in a sensitive position.

POSSIBILITY OF RECURRENCE OF ESPIONAGE

Mr. CANNON. Would that obtain in those instances in which members of your staff stole and delivered to the enemy secrets of the atomic bomb? Could that have been prevented by surveillance? Were there instances in which this fellow Fuchs, for example, was resurveyed or in which any attempt was made to keep track of his movements?

Mr. FIELDS. I do not know, sir. Of course, I was not in the project at that time.

Mr. CANNON. Could the same thing happen again under your plan of investigation?

Mr. FIELDS. For an individual of that nature it could perhaps happen again; yes, sir. However, I believe the present security systems and investigations do much to guarantee that such circumstances do not develop. There are very thorough background investigations now before the granting of clearances. This was not quite true in the cases during the war, as in the instance of Fuchs, sir.

Mr. CANNON. What effect does that have on the number of individuals requiring clearance? Would those fall under the category of "All others"?

Mr. MCCARTHY. They are not in this program, sir. In the case of the access permittees, we have an item "Security investigations" under the next program. We do this because in those particular cases we charge them for the access permit. That is for the investigation.

Mr. CANNON. You think we are as nearly protected as it is humanly possible to protect us against a recurrence of such cases as the Fuchs case?

Mr. FIELDS. I believe so; yes, sir.

"ALL OTHERS" CLASSIFICATION

Mr. CANNON. Now you say this does not fall under the category of "All others." What is included in that classification?

Mr. MCCARTHY. In the "All others" category, we have military personnel who are carrying on certain functions in connection with AEC. We also include some consultants. I do not have the exact tabulation, Mr. Chairman, but it includes that type of people who are working on our programs and does not include the people who are getting access permits under the industrial participation program. I can furnish you a breakdown of that. I don't have the specific

breakdown on that, Mr. Chairman. If you will note, in 1955 the "All others" column provided 10,599 permits.

(NOTE.—The breakdown is as follows:)

The "All other" category includes (1) personnel of other executive agencies and departments including Department of Defense employees who serve on intergovernmental committees; (2) employees of the General Accounting Office and congressional staff employees who require access to restricted data.

Mr. CANNON. In 1955 you had 10,599; in 1956, 2,480; 1957, 2,320. Does that indicate that the bulk of this work is over with; that you have practically stabilized the situation?

Mr. FIELDS. The provisions of the Atomic Energy Act of 1954 provide that clearance of Department of Defense personnel for access to restricted data under the Atomic Energy Act may be made on the certification of the Secretary of Defense. Prior to that time a clearance by the Commission with full field investigation by the Federal Bureau of Investigation was required, as was required for the personnel of our contractor forces and our own personnel. But by provision of the new act, the Department of Defense clearance is now utilized for purposes of certification by the Secretary of Defense, and would be considered adequate for clearance for access to restricted data. This reduced by a considerable amount the number of clearances required for their personnel and eliminated some of the duplication in the investigation of personnel of the Department of Defense.

The reduction between 1955 and 1956, basically, goes back to the Atomic Energy Act, which authorized the Secretary of Defense to make the clearance for the personnel of his Department.

ACCESS TO RESTRICTED AREAS

Mr. CANNON. In the spring of 1945 Secretary Stimson, Secretary of War at that time, requested that I go to Oak Ridge. We knew nothing about Oak Ridge at the time. We had reached the point where we were securing no visible results and were refusing to provide further money. I agreed to go if he would permit me to take the subcommittee, which at that time consisted of five members, including Mr. Taber. When we got down there, they told us the place was teeming with spies. They said there were spies there not only from every enemy country, but even from our allies. They knew many of them. But when they discovered a case by surveillance they did not let him know he had been detected; they left him alone and watched to see what his connections were.

The situation was that the whole place was full of spies. They made no attempt to keep them out. The routine was such and the work was so thoroughly departmented that none of them were in a position to coordinate anything that would give them any pertinent information.

Now, would you say that that situation still obtains, that you are still subject to espionage, but that you are insulated against their securing any material secrets at this time?

Mr. FIELDS. I would say we are insulated against them.

I think we have made a great deal of progress. The problem I would have in agreeing with your statement is that I am not convinced that we are riddled with spies at these installations. The evidence that I see does not indicate that. On the other hand, I think you have

to assume that there are probably definite attempts to get in and acquire information.

Now, the community of Oak Ridge is now an open community, that is, the city itself. We still operate the plants in the classified areas under strict security measures. They are set up as exclusion areas, with guards, and passes are required to get into these areas. So that your being in the town does not permit you to go into the classified area. This is true at Oak Ridge. It is also true at Hanford and at Savannah River. In addition each site is compartmentalized so that an employee working in one plant does not necessarily have access to another plant. He must have a reason for being in there.

We have a good system which insures that access is not available unless it is justified that you be there. You must have a specific clearance to enter the classified areas.

Mr. CANNON. That was true at Oak Ridge in the spring of 1945. For example, after involved routine, we were finally admitted to a building. After admission to the building I found I had left some papers out in the automobile. I went out to the car to get the papers, and when I came back, they would not let me in. They had admitted me 3 minutes before. They knew who I was. They knew the purpose for which I was there, and the same men were at the door, but they would not admit me. They had to go back and get authority, and I had to again be identified.

So I came away with the conviction that there was no chance of any foreign country securing any information. But, in spite of that conviction, I was dead wrong, because the enemy was at that time getting everything they wanted, and eventually stole the secret of the atomic bomb. I don't suppose there was any secret at Oak Ridge that Russia did not have at that time, or soon after.

There is reason to think that Russia today has as much, and perhaps more information about our military programs and schedules and outlay than we have ourselves. What about that situation?

Mr. FIELDS. We are of the opinion that there is a good deal of information which they have not had access to by espionage, and even at Oak Ridge we are quite convinced that certain information has not filtered through to the Russians by way of Fuchs and others.

Mr. CANNON. You think we now have important secrets that have not been divulged to Russia?

Mr. FIELDS. That is correct; yes, sir.

Mr. CANNON. You think our secret research is as bulletproof as it could be made?

Mr. FIELDS. I believe so; yes, sir. By thorough investigation, careful physical security measures, constant checks of physical security and constant checks in document control, I think we have as good a system as could be devised at this time.

Mr. CANNON. We must concede, however, that on the other side they have as effective a system of espionage and infiltration as could be humanly devised. Our experience would seem to demonstrate that fact.

Mr. FIELDS. It would seem to; yes.

Mr. CANNON. Mr. Rabaut.

Mr. RABAUT. I am satisfied with the facts developed by you, Mr. Chairman.

Mr. PHILLIPS. In the mystery thrillers, General Fields, the spying is always done by some outstanding character, but actual espionage is a patient and persistent and tedious compilation of small items by many people which are put together to bring out some small conclusion which may in the long run be pertinent.

Now, a little while back we had a theory prevalent in some quarters that to charge anybody with espionage or disloyalty was just a red herring, and I am reminded at the moment that some of the people who defended employees of the Government who subsequently went to jail have never publicly changed their opinons regarding those employees.

The next step was to have a loyalty program about which you are now testifying. That loyalty program had in it two facets, loyalty and security, and I was very sorry indeed when an effort was made to make political capital out of the program because my question is, aren't they almost of equal importance in the security of this country? A man may be 100-proof loyal, but if he has a tendency to drink too much he is just about as dangerous, if not more so, than a man who is an outright spy, who I think are probably rather limited in their numbers.

Now, we have at the present time, a change in the program brought about by the Supreme Court decision. I have an inherent respect for the Supreme Court, but I have as yet been unable to understand that decision, because how can you determine a sensitive position to meet the opinion of the Supreme Court. The janitor is in just as sensitive a position in some areas as would be the scientist who might be classified as sensitive. The American people as a people are notably lacking in reticence. We have never had occasion to feel that we have to be extremely careful about what we say. The casual conversation, in a corridor, of people walking through a nonsensitive area could be just as successful in offering one small piece of the picture puzzle as the man who deliberately set out to copy a blueprint. How can you determine today, under this Supreme Court decision, what is a sensitive position?

Mr. FIELDS. Our sensitive positions are primarily determined on the basis of access to classified information, sir. The information we are dealing with is national-defense information. It may be weapons information or it may be production information, so ours is somewhat different from a straight loyalty program. We consider loyalty, character, associations and a number of other things. We do not consider just loyalty alone in granting security clearance. We have to determine that the overall defense of the country is benefited by giving clearance on the basis not only of loyalty, but character, associations, and other matters than just loyalty. So our program is based primarily on access to classified information and the sensitive positions, for example, those dealing with weapons design, weapons production or the production of fissionable materials, where we do feel that we still have many secrets, at Oak Ridge, at Hanford, and in our other installations.

Furthermore, all of our Government personnel, by Commission policy, require full background investigation. This includes all of our direct employees, whether they are in sensitive positions or not.

Now, practically all of them are in a sensitive position in the sense that they could have access to such information in one way or another.

Mr. PHILLIPS. That is my point. The scientist whom you classify as being in a very sensitive position is going to eat lunch in a restaurant where the employees are not classified and cannot be classified, under the Supreme Court decision. In other words, what handicap will be placed upon you and upon the security of the United States by the recent Supreme Court decision?

Mr. FIELDS. I don't believe any handicap will be placed upon us, sir, because all personnel are cleared for work in our facilities, and there is so much of it that is classified so that this policy will continue.

Mr. PHILLIPS. Is that due to the fact that your act has special sections covering this subject?

Mr. FIELDS. Yes, sir; the act defines restricted data.

Mr. PHILLIPS. That is all, Mr. Chairman.

SECURITY INVESTIGATIONS BY THE FBI

Mr. CANNON. The gentleman from California makes a distinct contribution to our consideration of this question, especially in his evaluation of the effect of the Supreme Court decision.

In that connection, General Fields, you apparently have a different system and a little different standard from that of the Federal Bureau of Investigation. The Federal Bureau of Investigation, when it looks into the security program as it affects its own staff, takes the position that those whom it investigates are guilty until proven innocent. That is, as our courts have said, at direct variance with the fundamental concepts of our form of government. But it is a matter of self-preservation, the maintenance of our form of government, and the liberty and lives of millions of American people. You seem to approach the problem with the idea, the basic American principle, that everybody is innocent until proven guilty.

We cannot tamper with that. But in time of war, in time of acute national danger, we are menaced by a situation in which for the time being we cannot observe hairsplitting niceties. Is it possible there are opportunities for traitors to remain undisturbed under your system, whereas the FBI would screen them out. Do you think the distinction between these two forms of evaluations which have been touched on by the gentleman from California, Mr. Phillips, are of sufficient importance to have received any special consideration on your part in establishing your system of security?

Mr. FIELDS. Mr. Chairman, our investigative agency is the Federal Bureau of Investigation or the Civil Service Commission. Depending upon the sensitivity of the position, the original investigation may be performed by the Federal Bureau of Investigation. So that we utilize the Federal Bureau of Investigation.

Mr. CANNON. You utilize it, General Fields, but the significance you attach to derogatory information and your requirements are not as stringent on your own personnel as the requirements of the FBI on its personnel.

Mr. FIELDS. Our requirements are rather stringent, sir, for our own personnel. You see, they give us the reports of their investigation, including the derogatory information which is developed and anything which they develop counter to that information. They give us the

complete report. We make an evaluation of that report and we determine whether the information is sufficiently derogatory so that we cannot grant a clearance. We do the evaluation and exercise the judgment. But the basic data comes from the Federal Bureau of Investigation, and I presume their investigation is just as extensive for our personnel as it would be for their own. They do the evaluation for their own personnel and I am not acquainted with the criteria they use to determine whether to give clearance.

Mr. CANNON. Evidently it is more effective than yours because under your system traitors have been cleared. I have not heard of a single instance in which traitors were cleared by the FBI in their investigation of their own personnel.

Mr. FIELDS. Mr. Chairman, I know of no instance since the Commission has been in operation and utilizing the services of the Federal Bureau of Investigation in which a traitor was cleared. Fuchs and the others came in during the wartime period. They were not investigated by the Federal Bureau of Investigation.

Mr. CANNON. These men then who carried this vital information directly to Russia, who have brought about a situation which today imperils the United States and world peace—you say their operations were prior to the adoption of your present method?

Mr. FIELDS. Yes, sir.

Mr. CANNON. You say you have had none since?

Mr. FIELDS. There has not been a recurrence since the Federal Bureau of Investigation has been doing this work.

Mr. PHILLIPS. Mr. Chairman, will you yield for a very brief question?

Mr. CANNON. Yes. The gentleman from California.

Mr. PHILLIPS. It raises a question of interest, Mr. Chairman. Was there any security investigation of these original groups in the Manhattan project, and the scientists who started on this investigation? Was there any check at all on them?

Mr. FIELDS. It is my understanding that there was, sir, and that it was performed initially, by the Department of Army Intelligence, and then later by the Manhattan District itself. Whether or not the Manhattan Project investigated Fuchs, I do not know. He was a British subject, as you recall, who worked in this country. I could go back and check that, but on that point I do not know.

SECURITY CLEARANCE OF PERSONNEL OF FOREIGN GOVERNMENTS

Mr. CANNON. Do you ever accept certification of foreign governments as a substitute for your own investigation?

Mr. FIELDS. No, sir; not for employment in the United States. Under the present arrangements under the bilateral agreements the countries conduct their own investigations and give this country assurances as to the clearance of the personnel involved.

Mr. CANNON. You accept their clearance?

Mr. FIELDS. We accept their clearance at the present time.

Mr. CANNON. How many individuals are involved?

Mr. FIELDS. That is not for employment in this country, you understand, sir.

Mr. CANNON. That is solely for employment abroad in the country which has cleared them.

Mr. FIELDS. Yes, sir.

INDIVIDUALS DENIED CLEARANCE BUT SUBSEQUENTLY CLEARED

Mr. CANNON. How many individuals who have been denied clearance under your system have been subsequently cleared?

Mr. FIELDS. I would have to get a report on that, sir.

Mr. CANNON. Suppose you supplement your testimony with that information.

Mr. FIELDS. All right, sir.

Mr. PHILLIPS. How cleared, Mr. Chairman?

Mr. CANNON. Under his system, cleared for access to sensitive information.

Mr. FIELDS. We have cases where certain derogatory information develops. We have personnel review procedure, through a system of hearings before review boards appointed to hear cases. There are instances where questions have been raised, and then clearances have been granted when the case is fully completed and the investigation completed. But I would have to get you information on this, sir. I do not have it available.

Mr. CANNON. You may supplement your testimony, if you will.

(The information requested is as follows:)

There has been one case in which a person has been denied clearance and has subsequently been cleared.

SECURITY CLEARANCE OF PERSONNEL OF FOREIGN GOVERNMENTS

Mr. RABAUT. When other governments say to us, "this person is cleared for this type of work," is that all that we require of them or do we investigate the person, too?

Mr. FIELDS. We accept their statement at the present time. But let me give you the background first. Before we enter into an agreement for the exchange of classified information we reach a separate agreement on the security systems which will obtain in each of the countries. Prior to releasing classified information, we assure ourselves that their system is adequate for the purpose of this bilateral cooperation. In other words, we check their security system, their means of investigation, their physical security, and their document control.

Mr. RABAUT. That all sounds fine, but we failed in one case, didn't we?

Mr. FIELDS. I am not informed as to whether there was this sort of understanding prior to the case to which you refer.

Mr. RABAUT. You see, the effect of the failure in a number of these cases is really what is disturbing the whole tranquility of the world. Now, that is what I think the chairman is trying to bring out so forcibly here and correctly, too.

Mr. PHILLIPS. I would like to ask General Fields, How much of the information we have today is actually being given to other nations? Haven't we under classification a certain amount of information that we are not even giving to some of our allies?

Mr. FIELDS. Yes, sir. However, under these arrangements no weapons or production information is being exchanged, other than some information on the effects of weapons; that is, what happens to structures under the blasts of atomic bombs. But no weapons design

information and no weapons production information whatsoever is being exchanged.

There is an exchange of classified information on projects similar to those on which we are working, such as in the power reactor development field. We do collaborate with them in this area.

Mr. RABAUT. How much evidence do we have from them that they are working in those particular fields? Is it just a statement?

Mr. FIELDS. No, sir; we determined this fact by visits. Our personnel have been there and have seen the activities. They have seen the laboratories where the work is going on and we know that it is actually in progress.

Mr. RABAUT. We know that the work is going on and they have made a certain amount of progress.

Mr. FIELDS. Yes, sir. Mr. Strauss, our Chairman, Mr. Davis, Director of Reactor Development, and others have visited these installations, in the United Kingdom and other countries. They know what is going on. In some of these areas very valuable data is being exchanged with us, which is of great assistance to us.

Mr. PHILLIPS. I would like to suggest if perhaps we don't have a problem in other fields besides this specific atomic-energy field. I will say first that I have always felt that the bomb sight and the proximity fuse certainly were at the time in World War II almost of as much value as whatever we had in atomic energy at that time. If I remember rightly they were given away by one of our allies, were they not?

Mr. FIELDS. I do not know.

Mr. PHILLIPS. We furnished the designs to our allies.

Mr. FIELDS. I think there was considerable exchange during the war. There is certainly valuable information available in other agencies, too.

Mr. PHILLIPS. Of course, eventually a country could find out some of these things without necessarily spying. I think they could read the U. S. News & World Report and find out a good deal about our planning, and then put the stuff together, and also have actual physical observation of our planes or of our bombsights if a plane were wrecked. and so forth. These things eventually become public property.

Mr. FIELDS. Such information eventually becomes public property. For another reason, also, because of the laws of nature, you cannot keep them concealed.

Mr. PHILLIPS. That is right. I think we overlook that point, and make too much emphasis on hiding things which cannot be hidden for more than a limited time. I do not want to give the wrong impression about the U. S. News & World Report. I think it is the best magazine I read. But I think they do bring out, as all magazines, the designs of planes; the wasp-waisted plane that was the most secret thing we had in our subcommittee a year ago was a new design of a plane, which gave the plane certain abilities and characteristics that we never had before. It was the most secret thing when the NACA came up before our subcommittee a year ago. But it was revealed and put in the magazine by the publisher of an aviation magazine. He said he would not keep the secret any more because as soon as the plane was landed on an airport, it was no longer a secret. I think he had a point.

Mr. FIELDS. It is true in some instances, when you have reached the point of use, you are just licked, you cannot hide it.

Mr. PHILLIPS. But you do not have to tell them how we did it.

Mr. FIELDS. No, sir.

SUCCESS OF RUSSIAN ESPIONAGE

Mr. CANNON. At the same time the Russian secret service has run rings around us, has practically out-generaled us at every point, whereas the old German and Japanese systems were not able to break any of our information.

The thing which the gentleman from California mentioned, the proximity fuse, was never solved by Germany or Japan. In Japan some of our proximity fuses went completely over the enemy ships in the battle of the Coral Sea. Some of our proximity fused projectiles went entirely over the ships and exploded near the surface on the other side, and the Japanese thought that we had another submarine over there that was firing at them from the other side, and it aided materially in our driving them back in our naval battle because they did not understand the proximity fuse at all.

On the other hand, the Germans never solved it because they got the impression that when these proximity-fuse projectiles touched the branches of the trees that that is what exploded them, and they called them twig breakers. What did they call them? I think they called them twig breakers. Anyway, the Germans did not realize that it was a proximity fuse that exploded on nearing the target, but they thought they exploded only when they hit the branches of the trees, so we completely outgeneraled the Germans, we completely outgeneraled the Japanese. Until the very close of the war they did not understand the proximity fuse.

On the other hand Russia has solved practically every secret that we have tried to keep from her.

Mr. PHILLIPS. If the chairman will permit me, he is making a very important point which has to be understood in this country. It is not, in my opinion, the spies. I don't think that Russia has any better spies than anybody else. But Russia has a philosophy which it has been able to impose upon people who then become dedicated Communists, and feel their job, for the sake of peace in the world, is to get information and deliver that information to what is to them a movement for international peace, and the future of the common people. That is a very different thing from a spy system which sends somebody in on a salary to get a secret.

I don't know how we are going to lick that at the present time by any antispy system, do you, General Fields?

Mr. FIELDS. I do have, however, the impression that the situation has changed somewhat in the last 5 or 6 years.

Mr. PHILLIPS. It has changed definitely.

Mr. FIELDS. There is now a better realization in the minds of the public as to the true situation here which did not obtain in 1946 and 1947.

Mr. PHILLIPS. Take that man Fuchs, he is not properly described as a spy.

Mr. FIELDS. As I understand the case, you would not put him quite in the category of a spy. He was a confirmed Communist.

Mr. PHILLIPS. He came in as a dedicated Communist. I don't know whether he was when he came in, or if he became one, and his philosophy, which is almost a religion when you really become a dedicated Communist, was that he had to do this for the peace of the world. I don't think he did it for money, did he?

Mr. FIELDS. I don't believe he did, either.

Mr. RABAUT. Are they doing it for the peace of the world or the conquest of the world?

Mr. PHILLIPS. They think they are doing it for the peace of the world.

Mr. FIELDS. Our procedures are set up to make every effort that we can think of to discover an individual who might be Communist inspired or have these ideals. Under those circumstances we would not employ him, but I agree with you, Mr. Phillips, that this is the kind of an individual who is probably more hazardous than the spy.

Mr. PHILLIPS. That is the basis of my question to you. The homosexual, the drunkard, the dedicated Communist, the addict, even the gullible little individual who believes he is doing this for the benefit of mankind, is often more dangerous than the professional spy.

Mr. FIELDS. Yes, sir.

Mr. RABAUT. You were going to say a moment ago, General, what changes you thought have come about in the last few years. I don't think you developed that point.

Mr. FIELDS. It is my feeling that in the period right after the war, when Russia had been our ally, there were a great many people whom you might call dupes who were influenced, who were loose thinkers, and who thought more of the Russian system then than they do now. I think some of the things which have happened since that time have brought more insight to the man who was politically naive in those days. I think it is more in the forefront now, so that the instances of loose talk and the accidental revelations in my estimation would be fewer now. This is not to say that we do not still have the fanatic or the Communist who is a real worry, but I think we have fewer of those people who would try to argue on a political basis that there is something in the Russian system.

Mr. RABAUT. I agree with you because they had, for example, the leaders of the three countries, Churchill, Roosevelt, and Stalin, sitting together and shown in pictures, and the person said, "Well, I am going this way, too." They did not know whether to stay with their own or go with the others in their thinking.

OTHER COSTS AND APPLIED REVENUES

Mr. CANNON. Passing on to the next two headings, we will consider them together. The two headings are "Other costs" and "Revenues applied".

JUSTIFICATION OF THE ESTIMATE

We will place in the record at this time the justification pages 147 and 148, and in the second instance pages 150 to 152, inclusive.

(The pages of the justification follow:)

Other Costs

Program statement

Estimate, fiscal year 1957	$6, 375, 000
Estimate fiscal year 1956	5, 270, 000
Increase	1, 105, 000

Under "Other costs," the Commission budgets for costs incurred in the manufacture of materials which it sells to eligible purchasers and in rendering laboratory, research and other services to industrial and research organizations through the industrial participation program inaugurated by the Atomic Energy Act of 1954. It should be pointed out that, with certain exceptions, such as the subsidies provided in the case of isotopes for medical and agricultural research, the Commission is reimbursed for these costs and such reimbursements are applied to reduce the Commission's fund requirements. They constitute an offset against "Other costs" and are shown in the budget under the heading "Revenues applied."

Summary of estimates by category

Category	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
1. Costs incurred for others:			
(a) Cost of products sold	0	$3, 104, 000	$3, 200, 000
(b) Cost of services performed	0	2, 775, 000	3, 175, 000
(c) Geneva Conference	$1, 021, 000	821, 000	0
2. Adjustment of prior year costs	−11, 381, 343	−1, 430, 000	0
Total other costs	−10, 360, 343	5, 270, 000	6, 375, 000

1. (a) Cost of products sold, $3,200,000

The estimate of cost of products sold covers the manufacturing costs of certain special reactor materials sold to eligible purchasers.

(b) Cost of services performed, $3,175,000

Under the Atomic Energy Act of 1954, the Commission is moving forward with a program for extending cooperation and assistance to industrial concerns and others interested in atomic-energy matters. This program includes research studies and assistance, the preparation of technical studies and reports for sale to such organizations, and security investigations of individual employees. Although there is no prior experience on which to base a definitive estimate of the amount and costs of such services in fiscal year 1956 and fiscal year 1957, the estimates which have been developed represent the Commission's best judgment of the probable demand. To the extent costs may not attain the estimates, there would be a proportionate decrease in reimbursements shown under "Revenues applied" so that the net budgetary effect under such circumstances would not be significant. The estimates developed for costs of services performed are itemized as follows:

	Fiscal year 1956	Fiscal year 1957
Research studies and assistance	$1, 600, 000	$2, 000, 000
Technical studies and reports	825, 000	825, 000
Security investigations	350, 000	350, 000
Total	2, 775, 000	3, 175, 000

Research studies and assistance.—Work performed by AEC-owned or operated laboratories to conduct types of research for which industrial concerns would not have adequate facilities. The increase is related to probable industry interest in such services.

Technical studies and reports.—Printing and distributing scientific documents on atomic energy otherwise would not be available to the public.

Security investigations.—Investigations of licensees and others required by law.

(c) *Geneva Conference, 0*

This is a nonrecurring cost for which no estimate is projected for fiscal year 1957.

Revenues Applied

Program statement

Estimate, fiscal year 1957	$33,797,000
Estimate, fiscal year 1956	30,226,000
Increase	3,571,000

Cash revenues from community operations, revenues obtained from sale of products or services to others, and income from miscellaneous sources are applied as a reduction to the overall cost of the atomic energy program, thereby reducing appropriation requirements. In fiscal year 1956 and prior years, additional obligational authority was requested to offset the amount of funds deposited to the United States Treasury. Under the authority requested in fiscal year 1957 to apply receipts against fund requirements of the Commission, the budget estimate is reduced by $1.7 million.

Summary of estimates by category

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
1. Revenues:			
(a) Income from products sold	$3,644,727	$10,310,000	$12,903,000
(b) Income from services	324,519	2,597,500	3,297,000
(c) Cash revenues from communities	21,596,504	20,998,500	16,497,000
(d) Other income	1,602,504	1,100,000	1,100,000
Total revenues	27,168,254	35,006,000	33,797,000
2. Less funds returned to Treasury:			
(a) Excess community revenues	3,025,000	2,900,000	0
(b) All other	6,975,808	1,880,000	0
Total funds returned to Treasury	10,000,808	4,780,000	0
Total revenues applied	17,167,446	30,226,000	33,797,000

JUSTIFICATION OF CATEGORIES

1. Revenues

(a) *Income from products sold, $12,903,000.*—This estimate covers the income which it is estimated will be received from the sale of isotopes, metals and certain special reactor materials. Additional information of a classified nature is presented on page 153.

(b) *Income from services, $3,297,000.*—As pointed out under the budget heading "Other costs," the estimated income from services rendered by the Commission under the industrial participation program authorized by the Atomic Energy Act of 1954 represents an offset to the budgeted costs of such services. The estimates, as in the case of those under "Other costs" have no basis in prior year experience and represent the Commission's best judgment of the probable income which will be received. The details are as follows:

	Fiscal year 1956	Fiscal year 1957
Research assistance	$1,900,000	$2,400,000
Tuition at reactor schools	142,500	392,000
Argonne and Brookhaven Hospitals	255,000	205,000
Security investigations and sale of technical studies and reports	300,000	300,000
Total income from services	2,597,500	3,297,000

Research studies and assistance furnished industrial and technical organizations are expected to reach a level of $2.4 million in fiscal year 1956 and fiscal year 1957.

Tuition receipts increase at the Argonne School of Nuclear Science and Engineering and the Oak Ridge School of Reactor Technology resulting from more extensive courses and more students anticipated in fiscal year 1957.

Hospital revenues are estimated to decline in fiscal year 1957 consistent with an expected increase in the number of free patients admitted for research purposes at the Argonne Hospital.

Charges for security investigations and printed technical studies and reports are applied as income to reduce the appropriation request with no change projected for fiscal year 1957.

(*c*) Cash revenues from communities, *$16,497,000.*—The cash revenues from the operation of AEC-owned communities are applied as a reduction against the appropriation requirements consistent with previously accepted practice of the Commission. In this budget submission, such revenues are treated with other revenues applied and do not appear as a direct reduction in the justification statement of community-operating costs. The decrease in community-cash revenues of $4,501,500 in fiscal year 1957 reflects reduced income, consistent with the anticipated sales of revenue-producing property in the Oak Ridge, Tenn., and Richland, Wash., towns during that year.

(*d*) Other income, *$1,100,000.*—Other revenues include income derived from royalties on natural resources, interest, income from collateral funds, income from rental of Government-owned facilities and other miscellaneous sources of a general nature.

2. Less funds returned to Treasury, none

This item is not included as an offset to revenues in fiscal year 1957, since authority is requested in the appropriation language to apply receipts against the appropriation requirements of the Commission.

Mr. CANNON. We shall be glad to have any comment you care to make.

Mr. FIELDS. I would like to have Mr. McCarthy comment on these.

GENERAL STATEMENT

Mr. MCCARTHY. Mr. Chairman, these two programs are set up a little differently than last year. The 1954 Atomic Energy Act provides of course that the Commission furnish services to industry to the extent that such are available to the Atomic Energy Commission. We have under that act in 1956 started to sell some products of the Commission, and also furnished some services.

In 1957 our budget estimates that we will sell roughly $3,200,000 worth of products. These are shown on page 149 and include the sale of heavy water which the Commission produces at its Savannah River and Dana plants. In addition, we estimate the cost of services performed. The cost to us of performing those services would be $3,175,000. These would provide research studies and assistance, including radiation services in reactors available to the Atomic Energy Commission, furnishing technical studies and reports, and also providing security investigations at a charge, of course, to the industry.

On the revenue side we have shown the estimated revenues as income to us. In 1956 the total is $30 million, which includes the revenues from the communities and which is the largest single amount. This item formerly was set forth as an offset to costs under the community program.

In 1957, the estimated income is $33,797,000 including income from products sold.

Now, on page 151 the income from services is estimated at $3,297,000.

SOURCE OF INCOME

Mr. CANNON. You have given us information which was not brought out in the justifications. In the justifications we get the

impression that this entire income of $3,200,000 is derived solely from the sale of heavy water, only one of these products. Your inference now is that the $3,200,000 includes not only receipts from heavy water, but also from isotopes, uranium, and thorium.

Mr. McCarthy. The $12 million income does, Mr. Chairman.

Mr. Cannon. That would be your entire income. It is not solely from one product?

Mr. McCarthy. That is correct.

Mr. Cannon. But there is no mention of it. You refer to the cost of heavy water; and although you include the revenues you do not include the cost of isotopes, thorium, uranium, and so forth.

Mr. McCarthy. The cost of the isotopes production is included in the physical research program. The cost of production is considered as a part of that program.

Mr. Cannon. Did you at that time also discuss the income from the heavy water?

Mr. McCarthy. No, sir; the heavy water we reserved until we met this program here.

Mr. Cannon. While it may be mere bookkeeping, it is rather puzzling as to why you separate the cost, but do not separate the revenues.

Mr. McCarthy. The cost of isotopes, Mr. Chairman, is shown on page 92.

Mr. Cannon. But why are they considered separately in one instance, and not in the other. You consider them separately in cost, but not in revenues.

Mr. McCarthy. In this particular budget, we are trying to get our accounting for the revenues versus the cost. This is the first year we have tried to do this. We are also trying to segregate the cost of the products we sell.

Mr. Cannon. In future budgets this will not be true?

Mr. McCarthy. That is correct.

COST OF PUBLISHING TECHNICAL REPORTS

Mr. Cannon. Now, you list here $825,000 for technical studies. These technical studies include what?

Mr. McCarthy. These are the publication of reports mainly of technical information. I mentioned Friday, I believe, the program for the declassification and printing of technical reports, which would be sold to industry.

Mr. Cannon. When you speak of the cost of these reports, you include the cost of editing, the cost of printing, the cost of distribution and other incidentals. But apparently you do not take into consideration the cost in man-hours of the authors. You do not include labor?

Mr. McCarthy. The technical reports, of course, are furnished mainly as a result of completion of investigations and research required for our own program.

Mr. Cannon. That should include man-hours on the part of the people who write these reports, but you do not show that you include that as a part of the cost.

Mr. McCarthy. These reports of course are furnished by our project people. At a later date they are declassified and made available to industry and in the price we charge for all costs of printing plus,

as we mentioned the other day, the 15-percent surcharge, to cover all other costs.

Mr. CANNON. That 15 percent includes labor? That includes the man-hours of those who drafted the final version of the report?

Mr. BURROWS. No.

Mr. CANNON. Why not?

Mr. BURROWS. It would be very difficult to measure that cost, Mr. Chairman. It is a result of the entire work of the whole project. It may involve any number of investigators working on developments over a period of time. It would be very difficult accounting-wise to estimate the authors' cost in acquiring information.

Mr. CANNON. You concede it should be included, but you have not done so due to the difficulty of the bookkeeping feature of it?

Mr. BURROWS. That is correct and also under the theory, Mr. Chairman, that what we are trying to recover is the out-of-pocket cost incident to making the information available.

Mr. RABAUT. The material is declassified. Isn't that cost added?

Mr. BURROWS. We believe this would be adequately covered by the 15-percent factor.

Mr. RABAUT. That covers declassifying that for the releasing of it?

Mr. BURROWS. Yes, sir; but not the authors' time in the development of the information contained in the report.

Mr. RABAUT. That should be covered because it is directly connected with it.

Mr. BURROWS. It is very difficult to estimate. We would have to do that arbitrarily because one piece of information leads to another.

Mr. RABAUT. You think 15 percent covers it?

Mr. BURROWS. Not the author's time.

Mr. RABAUT. Not the author's time, but the reclassifying or searching through it to see that that part of it can be released.

Mr. BURROWS. I could not say this positively, sir; no.

COSTS INCURRED FOR OTHERS

Mr. CANNON. In that connection are we to understand, General Fields, that the $6,375,000 which is classified under "Costs incurred for others"—here on page 147—that they are expenditures that do not properly belong under any specific program?

Mr. FIELDS. Yes, sir.

Mr. CANNON. Why do you not also include the cost of training?

Mr. FIELDS. In this category?

Mr. CANNON. Yes; under cost incurred for others.

Mr. FIELDS. We do have training covered in the Reactor Division budget specifically, because it is a Reactor Division activity. It is not covered in here. Isn't this correct?

Mr. BURROWS. That is right.

Mr. CANNON. You do include security investigation.

Mr. FIELDS. This is security investigation for others than ourselves; yes, sir.

Mr. CANNON. Why do you not also include the cost of training?

Mr. FIELDS. Presumably we could.

Mr. MCCARTHY. We could do that.

Mr. CANNON. Wouldn't that be plainer?

Mr. McCarthy. We have considered the cost of the training program which we are conducting is somewhat in keeping with the program of the Commission, and we are trying to get the program cost segregated, but the training could be segregated and shown in other costs. It could be done that way.

Mr. Cannon. Also on the following page, page 148, in estimating cost you list separately the classification of technical studies and the classification of security investigations. But under "Revenues" on page 151 you lump the two items together. Why that disparity? Why are these considered as one on page 148 when you do not so consider them on page 151?

Mr. McCarthy. They should be broken out separately. They should have been given the same treatment.

Mr. Cannon. Are there further questions, gentlemen?

Increase or Decrease in Selected Resources

Turning then to page 154, referred to by the gentleman from California, we take up the title "Increase or decrease in selected resources."

Mr. Phillips.

Mr. Phillips. I just wanted to know what they meant by unpaid obligations on that list. I did not find any justification to show the breakdown for it.

JUSTIFICATION OF THE ESTIMATE

Mr. Cannon. We will include at this point in the record pages 154 through and including page 163 of the justifications.

Now we shall have you take up Mr. Phillips' question.

(The pages of the justification follow:)

Increase or Decrease in Selected Resources

Program statement

Estimate, fiscal year 1957	$765, 258, 394
Estimate, fiscal year 1956	715, 930, 394
Increase	49, 328, 000

The budgetary title "Increase or decrease in selected resources" appears as an item in the Commission's budget for the first time in this presentation of the fiscal year 1957 requirements. This new title includes the following items which previously were identified and justified separately in the budget documents:

Stores inventory	Collateral funds
Special reactor materials inventory	Unpaid obligations
Other special materials inventory	Working capital

Appropriation requirements of the Commission in fiscal year 1957 are related to the increase in unapplied resources over the amounts available at the end of fiscal year 1956. The increase of $49.3 million in fiscal year 1957 provides for an increase of $18.7 million in inventories and $30.6 million in goods and services on order. The increase in inventories consists of $14.5 million for special reactor materials reserve stocks, $2 million for stores inventories for expanded production operations and $2.2 million for inventory increases in nickel scrap. The major portion of the increase of $30.6 million in goods and services on order is due to the continuing increase in the level of the weapons and reactor development programs.

Summary of estimates by category

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Balances at end of year:			
1. Inventories:			
(*a*) Stores	$75,577,798	$77,732,791	$79,728,837
(*b*) Special reactor materials	16,689,444	32,240,000	46,734,000
(*c*) Other special materials	11,295,670	10,109,058	12,271,760
Total inventories	103,562,912	120,081,849	138,734,597
2. Collateral funds	22,890,000	21,290,000	21,290,000
3. Goods and services on order	492,083,710	574,558,545	605,233,797
Total unapplied resources at end of year	618,536,622	715,930,394	765,258,394
Increase or decrease (−) during year	−231,957,950	97,393,772	49,328,000

JUSTIFICATION OF CHANGES

1. Inventories, increase, $18,652,748

AEC inventories are normally financed by the issue of inventory items to users whose programs are charged for the cost of the items as they are withdrawn from stock. Funds made available to inventory accounts by these issues are then used for replenishing inventories. It is only when the total inventory level must be increased to serve new or expanded activities that additional appropriated funds are required. In fiscal year 1957 an additional $18.7 million is required because of the need to expand inventory levels related to the industrial participation and other program increases. Details of requirements are discussed under titles of "Stores inventory," "Special reactor materials," and "Other special materials."

(*a*) *Stores inventory, increase, $1,996,046.*—Stores inventories are supplies, materials, and parts normally used or consumed in the production of source and fissionable materials, in the maintenance of production plants, buildings, and other facilities, or in the operation of laboratories and experimental projects, towns, and administrative activities. Stores exclude source and fissionable materials, weapons components, reactor materials, and other special materials. Included in the AEC stores inventory are the following kinds of items:

Mechanical materials and supplies
Metals and metal alloys
Electrical materials and supplies
Fuels and lubricants
Chemicals and compounds
Building and road materials and supplies
Electronic supplies
Hardware and small tools
Laboratory supplies
Motor vehicle parts and accessories
Heavy mobile equipment parts and accessories
Office materials and supplies
Clothing
Custodial materials and supplies
Medical materials and supplies
Special process spares
Stores work in process
Returnable containers
Scrap

Stores inventory is divided into the following categories:

Current use stores are those materials, supplies, and parts stocked for use in the active operating programs of AEC.

Standby stores include only those materials, supplies, and parts held for future operation of facilities placed in standby; those items stocked solely for use in case of disaster, invasion, sabotage, fire, or explosion; and those specifically authorized to be stockpiled.

Excess stores are those materials, supplies, and parts generated by AEC operating programs which have been determined excess to the needs of an AEC

office or an AEC contractor as well as those determined excess to the entire AEC operation.

The fiscal year 1957 net stores inventory increase of $1,996,046 is primarily due to the additional current use stocks required for new plants and expanded operations.

Changes in inventory levels fiscal year 1957 are tabulated below:

	Estimate, fiscal year 1956	Estimate, fiscal year 1957	Increase or decrease (−)
Washington raw materials	$16,000	$16,000	0
Grand Junction	500,000	500,000	0
Hanford	9,479,181	9,479,181	0
Oak Ridge	36,610,780	37,917,397	$1,306,617
Santa Fe	15,483,702	16,090,545	606,843
San Francisco	1,624,029	1,910,707	286,678
Idaho	657,124	641,124	−16,000
Chicago	1,855,332	1,970,076	114,744
Schenectady	279,307	276,807	−2,500
New York	462,336	435,000	−27,336
Savannah River	10,765,000	10,492,000	−273,000
Total	77,732,791	79,728,837	1,996,046

The reasons for specific major increases are explained by operations office.

Oak Ridge, increase, $1,306,617: An increase of $1 million is required to bring the inventory level of the Goodyear Atomic Corp. to a point adequate for steady State operations by the end of fiscal year 1957. The remaining increase is to build up the inventories of the Mallinckrodt Chemical Works in preparation for startup of Weldon Springs operations.

Santa Fe, increase, $606,843: Required to increase Holmes and Narver, Inc. inventory level in connection with test operations after fiscal year 1957.

San Francisco, increase, $286,678: Procurement of items for establishment of a new classified weapons facility.

Chicago, increase, $114,744: Related to expanded operations of Brush Beryllium, the General Electric facility in Idaho, and other small items.

(*b*) *Special reactor materials inventory, increase, $14,494,000.*—This inventory consists of stocks of materials used in the construction and operation of reactors for production and research purposes. The increase in fiscal year 1957 will provide for operational spares and new uses under the industrial participation program.

(*c*) *Other special materials inventory, increase, $2,162,702.*—Other special materials inventory is made up of special materials which have a high monetary value in relation to volume or weight, and require special accounting controls.

The increase in the fiscal year 1957 estimate consists primarily of nickel scrap in the amount of $2.1 million for eventual distribution to the national stockpile under the General Services Administration.

The inventory levels at the end of fiscal years 1956 and 1957 are as follows:

Inventory item	Estimate, fiscal year 1956	Estimate, fiscal year 1957	Increase or decrease (−)
Gold	$247,764	$271,522	$23,758
Silver	50,166	50,523	357
Platinum	1,631,133	1,662,724	31,591
Radium	1,288,148	1,295,169	7,021
Radium sludge	915,309	915,309	0
Palladium	20,912	21,662	750
Rhodium	1,125	1,125	0
Barrier items	5,954,501	8,053,726	2,099,225
Total	10,109,058	12,271,760	2,162,702

2. Collateral funds, 0

These funds consist of insurance collateral funds, employee benefit, and annuity funds established under the provisions of contracts administered by the War Department. They were designed to provide for various extraordinary contingencies in the activity of cost-type contractors. For the most part, these funds are held by trustees and invested in United States Government securities. No additional funds have been established for the 2 years under consideration.

The following table indicates the status of the collateral funds as of the end of fiscal years 1956 and 1957 by office:

Office and contract	Estimate fiscal year 1956	Estimate fiscal year 1957	Increase or decrease (−)
Balance at close of year:			
Hanford:			
General Electric insurance fund, Travelers Insurance Co	$10,500,000	$10,500,000	0
Du Pont insurance fund, Travelers Insurance Co	2,100,000	2,100,000	0
Santa Fe: Los Alamos, University of California employment benefit fund	1,000,000	1,000,000	0
San Francisco: Berkeley, University of California employees benefit fund	490,000	490,000	0
Chicago: University of Chicago employees benefit fund	1,000,000	1,000,000	0
New York: Columbia University employees benefit fund	200,000	200,000	0
Washington: University of California, Los Alamos, and University of Chicago insurance fund, Royal & Globe Co	6,000,000	6,000,000	0
Total collateral funds	21,290,000	21,290,000	0

3. Goods and services on order, increase, $30,675,252

This item includes undelivered balances of materials, supplies and services on order under outstanding purchase orders and contracts. The amounts estimated reflect the unpaid obligations under contracts and purchase orders outstanding at the end of the year, less net accounts payable and accrued liabilities for goods and services received and charged to costs.

The net increase of $30.6 million in fiscal year 1957 is required for the following increases and decreases in "Goods and services on order":

	In millions
Increases:	
Increase in operation of facilities	$23.4
Increase for power reactors demonstration program	10.0
Increase for research and development	6.6
Total increases	40.0
Decreases:	
Decrease in procurement of special materials	7.1
Decrease in outstanding orders for equipment not included in construction projects	1.0
Decrease in utility contracts	.2
Decrease in other miscellaneous contracts	1.1
Total decreases	9.4
Net increase in goods and services on order	30.6

	Estimate fiscal year 1956	Estimate fiscal year 1957	Increase (+) or decrease (−)
1. Operation of facilities:			
(a) Source and special nuclear materials	$240,457,854	$231,856,510	−$8,601,344
(b) Weapons	105,976,000	126,136,000	+20,160,000
(c) Research and development	69,113,578	81,010,014	+11,896,436
(d) Supporting services	2,745,744	2,697,815	−47,929
Total	418,293,176	441,700,339	+23,407,163
2. Major procurement	59,979,936	52,845,936	−7,134,000
3. Utility contracts:			
(a) Electric power	232,000	232,000	0
(b) Natural gas	8,036,547	7,836,547	−200,000
Total	8,268,547	8,068,547	−200,000
4. Other:			
(a) Exploration	1,884,407	1,907,407	+23,000
(b) Research and development	50,026,833	66,691,833	+16,665,000
(c) Other	8,302,329	7,216,418	−1,085,911
Total	60,213,569	75,815,658	+15,602,089
5. Equipment not included in construction	27,803,317	26,803,317	−1,000,000
Total goods and services on order	574,558,545	605,233,797	30,675,252

1. Operations of facilities, increase, $23,407,163

The estimates provide forward financing of 3 months for research facilities and 6 months for production facilities. The changes are as follows:

(*a*) *Source and special nuclear materials, decrease, $8,601,344.*—The decrease is due primarily to lower costs estimated in fiscal year 1958 for the improvement program at Oak Ridge.

(*b*) *Weapons, increase, $20,160,000.*—This increase represents higher operating levels for weapons activities.

(*c*) *Research and development, increase, $11,896,436.*—This increase reflects higher cost and operating levels for developmental activities primarily in the reactor and research programs.

(*d*) *Supporting services, decrease, $47,929.*—This decrease reflects a reduction in supporting services provided by contractors at Oak Ridge.

2. Major procurement, decrease, $7,134,000

This represents a reduction in unpaid obligations under contracts for procurement of uranium, ores, and other materials used in production.

3. Utility contracts, decrease, $200,000

This represents a reduction in the cancellation liability under the contract with the East Tennessee Natural Gas Co. for supply of gas at Oak Ridge, Tenn.

4. Other, increase, $15,602,089

This item includes $10.0 million for the further advancement of civilian power technology in such areas as promise to contribute most to the attainment of economically competitive nuclear power, including especially assistance under attractive proposals which may be received from industry or public power groups; $6.0 million for possible commitments in 1957 under Project Sherwood not budgeted elsewhere; and a decrease of $0.4 million related to minor increases and decreases in amounts payable under contracts for miscellaneous off-site research and accrued administrative costs.

5. Equipment not included in construction projects, decrease, $1 million

This represents an expected reduction in outstanding orders for equipment not included in construction projects.

Mr. McCarthy. Mr. Chairman, the category "Increase or decrease in selected resources" is in our budget for the first time. In instructions for compiling the 1957 budget estimates the Bureau of the Budget set out this category which combines the changes in all assets available to the Commission. The breakdown first shows our inven-

tory picture; secondly, the change in collateral funds, that is, funds which are outstanding in the hands of contractors and are available to us; and third, goods and services on order. The last item covers the undelivered balances, under contracts at the end of the year.

Mr. PHILLIPS. Have they ever been set up in any justification before on that basis?

Mr. MCCARTHY. Yes, sir. Each year we set them up as the unpaid obligations and as working capital. I think you will recall, Mr. Phillips, the suggestion you made last year as to the working capital being an offset to unpaid obligations. It is treated that way under the Bureau of the Budget instructions.

INVENTORIES

Mr. PHILLIPS. Where does this come in on the justification item?

Mr. MCCARTHY. That starts on page 160.

Mr. PHILLIPS. That is all, Mr. Chairman.

Mr. MCCARTHY. Mr. Chairman, the first item is our stores inventory. Our stores inventories are estimated to increase by roughly $1.9 million in the fiscal year 1957 from a level of $77.8 million at the end of 1956 to a level of $79.7 million by the end of 1957. The increase is attributable generally to the requirement, at our Oak Ridge office, to bring stores for the Goodyear operation up to the steady state level required for their operation.

Mr. CANNON. Now, in this tabulation to which you refer on page 155, the balances at the end of the year and so forth, you refer to your inventories as increasing $18,652,748 whereas your total inventories were expected to be $115 million—that is what you told us the last time you were before us—$115,061,158. As a matter of fact, it turned out to be more than that. It became $120,081,849. So that instead of an increase of $18.6 million, it is really an increase of $23.7 million.

Mr. MCCARTHY. That is right, sir. The increase is in special reactor materials for the heavy water production. In 1956 we had estimated a greater usage of the heavy water produced at Savannah River and Dana which did not materialize. Therefore our inventories of heavy water at the end of 1956 will be greater than we had originally projected.

Mr. CANNON. Then this final figure you have here on inventories, justification of changes, an increase of $18 million, is really an increase of $23 million plus.

Mr. MCCARTHY. If one were to go back to the original 1956 budget as to what we projected at the end of 1956, that is true.

Mr. CANNON. Going back to 1954, Mr. McCarthy, your inventory was only $88,514,158. That is an increase of $50 million. That is a very substantial increase since 1954. How do you account for that unexpected rise?

Mr. MCCARTHY. In 1954, we were producing heavy water at our Dana and Savannah River plants, to complete the construction of the Savannah River reactors. This was for the initial charges of heavy water for those plants. In 1956 we will have completed the construction of the plants and completed the production of heavy water necessary for them, and we will be stockpiling heavy water production from the two plants. As a result, the production now goes into our

inventory and accounts for the big increase. Of course, our stores inventory have at the same time grown because of the increase in the level of operating costs since 1954.

COLLATERAL FUNDS

Mr. CANNON. You have been in very close touch at all times with Columbia University in this connection, but there is some indication that you are decreasing the extent of your collaboration with Columbia University? I notice, for example, here on your collateral funds item, page 159, that the only change you appear to have made relates to the Columbia University employees benefit fund. That means a reduction from $600,000 last year to $200,000 this year and next year. Does that mean that this can be reduced because there is a decreased participation of Columbia University personnel with your AEC activities?

Mr. MCCARTHY. No, sir. The collateral funds as you see them here are funds that are in the hands of contractors to cover them against liability for damages. These funds were established under some of the earlier contracts set up by the Manhattan District. We have been attempting to recover these funds as the years go on. We were successful in getting from Columbia University, a recovery of all but $200,000 of the $600,000 which was in their hands.

Mr. CANNON. Otherwise the participation of Columbia University is practically stabilized?

Mr. MCCARTHY. That is correct. The work will continue pretty much at the stable level.

ALL PROGRAMS—AEC DIRECT EMPLOYMENT

JUSTIFICATION OF THE ESTIMATES

Mr. CANNON. Let us turn to pages 167 through 172 of the justifications, and we will insert those pages in the record at this point. This data relates to all the programs as I understand it. What can you tell us about it at this time?

(Pp. 167 through 172 of the justification follow:)

ALL PROGRAMS—AEC DIRECT EMPLOYMENT

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Number of permanent civilian employees at end of fiscal year	6,013	6,691	6,976
Average number of permanent civilian employees	5,965	6,357	6,804
Man-year equivalent for terminal leave payments	63	51	50
Total man-years of full-time employment	6,028	6,408	6,854
Personal services cost	$35,601,222	$41,067,000	$44,150,000

A basic policy of the Commission is to conduct the atomic-energy programs through contractors. However, there are certain functions which must be performed by AEC employees in order to protect the Government's interests. These functions include—

1. Program planning and direction, contract negotiation, essential liaison with contractors, and inspection of contractor products. Administration of civilian application, licensing, and international cooperation activities.

2. Security measures involving screening of personnel, protection of documents and property, guarding of security shipments, and patrolling of sites where contractor guard service is not available.

3. Direct participation in raw materials exploration, domestically and overseas, operation of storage sites, operation of the New Brunswick laboratory, operation of the Los Alamos communications facilities, and the fire and police departments and monitoring radiation hazards.

4. Accounting, auditing, property management, and personnel services, assuring that adequate controls are maintained by AEC and contractors.

5. Control and dissemination of scientific and technical information to encourage scientific progress.

6. Supporting services required at 10 operations offices and the Washington headquarters.

The increase of 285 employees proposed for fiscal year 1957 year-end strength is required principally because of expansions in the civilian-application and atoms-for-peace programs as well as the weapons and reactor-development programs. The increase in personal services costs of $3.1 million estimated for fiscal year 1957 is required for this strength increase, and to cover the full-year costs of employees added in fiscal year 1956 related to increases in weapons production, raw-materials exploration and procurement, development of reactors, and civilian application of atomic energy.

The following table provides a comparison of average employment, year-end strength, and personal services costs for each of the Commission's programs for the fiscal years 1956 and 1957.

Programs	Fiscal year 1956			Fiscal year 1957		
	Average full-time employment	End strength	Costs	Average full-time employment	End strength	Costs
Raw materials	407	430	$2,344,000	409	430	$2,349,000
Special nuclear materials	189	193	1,176,000	188	190	1,173,000
Weapons	991	1,151	5,963,000	1,164	1,179	7,098,000
Reactor development	172	177	987,000	177	177	1,023,000
Biology and medicine	78	80	452,000	77	80	457,000
Community	139	139	800,000	138	138	805,000
Program direction and administration	4,358	4,494	29,222,000	4,624	4,755	31,133,000
Other costs	23	27	123,000	27	27	112,000
Total	6,357	6,691	41,067,000	6,804	6,976	44,150,000

ALL PROGRAMS—TRAVEL

	Fiscal year 1955, actual	Fiscal year 1956, estimate	Fiscal year 1957, estimate
Estimated number of travel days	121,902	162,362	172,990
Total estimated costs	$2,210,071	$3,070,000	$3,350,000

Travel on the part of Commission personnel is required for accomplishment of the assigned objectives of the agency. Geologists in the raw-materials exploration program and shipment security guards in the special nuclear materials, weapons, and reactor development programs spend a large part of their duty time in travel status. Travel is also required for weapons production, inspection, and storage activities and for radiation surveys in the biology and medicine program. Administration of contracts, inspection and audit functions, and work with contractors on new technical and scientific developments require extensive travel to plants and laboratories.

The fiscal year 1957 estimated increase of $280,000 in travel costs includes an increase of $156,000 under the weapons program due to an increased volume of security shipments and an increase in the number and activity of storage sites.

An additional $20,000 is proposed for increased security shipment travel in the special nuclear materials and the reactor development programs and additional travel in exploring new sources of raw materials. An increase of $104,000 is required for program direction and administration travel in connection with the development of new reactors, expansion in the weapons program, an increase in applications for licensees on the part of private enterprise, the program for international cooperation, and increased procurement of raw materials.

The following table compares the number of travel days and travel costs for each of the Commission's operating programs for fiscal year 1956 and fiscal year 1957.

Programs	Fiscal year 1956		Fiscal year 1957	
	Travel days	Cost	Travel days	Cost
Raw materials	61,487	$460,000	63,946	$489,000
Special nuclear materials	11,364	146,000	9,332	159,000
Weapons	23,842	518,000	30,565	674,000
Reactor development	2,456	58,000	3,055	69,000
Biology and medicine	1,357	46,000	1,504	51,000
Community	199	4,000	199	4,000
Program direction and administration	60,492	1,795,000	64,225	1,899,000
Other costs	1,165	43,000	164	5,000
Total	162,362	3,070,000	172,990	3,350,000

Statement on Passenger-Carrying Motor Vehicles

	Actual, 1955	Estimate, 1956	Estimate, 1957
Net active fleet end of fiscal year	2,522	2,323	2,211
Number of replacement vehicles	258	479	306
Cost of replacement vehicles	$377,782	$1,001,337	$754,695

The AEC motor-vehicle fleet is required for security patrols of extensive plant and laboratory areas, management and administration of AEC-owned communities, inspection and audit of Commission and contractor-operated facilities, and for necessary official transportation of AEC and contractor personnel within and between project sites and areas in the management and operation of the programs conducted by the agency.

Table A below shows the motor-vehicle requirements, by type, for fiscal year 1957. The estimate includes requirements for contractor operations, and for vehicles required by the AEC. Motor-vehicle replacements requested meet or exceed the GSA standards. The estimate includes only replacement purchases, and steps have been taken to reduce the total fleet as shown in table B.

Table A.—*Passenger motor-vehicle replacement requirements*

	Actual, fiscal year 1955		Estimate, fiscal year 1956		Estimate, fiscal year 1957	
	Number	Cost	Number	Cost	Number	Cost
Automobiles	238	$321,380	437	$658,038	255	$379,775
Station wagons	14	24,900	27	63,049	33	79,170
Ambulances	1	2,619	2	12,850	2	7,900
Buses	5	28,883	13	267,400	16	287,850
Total replacements	258	377,782	479	1,001,337	306	754,695

Table B.—*Net active fleet at end of year*

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Automobiles	1,898	1,689	1,575
Station wagons	93	111	117
Ambulances	63	63	59
Buses	468	460	460
Total	2,522	2,323	2,211

The Atomic Energy Commission has an active program to promote improved fleet management, through use of motor pools, more effective utilization of equipment and use of GSA interagency motor pools where possible. This program together with the completion of major construction has resulted in a reduction in the vehicle fleet, even though program operations have continued to expand.

COMPARATIVE STATEMENT OF OBLIGATIONS BY OBJECT CLASSIFICATION

Operating expenses, Atomic Energy Commission

Object classification	1955 actual	1956 estimate	1957 estimate	Increase or decrease (−) 1957 over 1956
ATOMIC ENERGY COMMISSION				
01 Personal services	$35,601,222	$41,067,000	$44,150,000	$3,083,000
02 Travel	2,210,071	3,070,000	3,350,000	280,000
03 Transportation of things	3,739,141	5,853,262	5,743,634	−109,628
04 Communication services	3,015,970	2,943,700	3,003,520	59,820
05 Rents and utility services	164,390,496	232,011,457	230,123,376	−1,888,081
06 Printing and reproduction	605,598	849,250	434,320	−414,930
07 Other contractual services	418,937,967	832,908,233	1,004,706,065	171,797,832
Services performed by other agencies	12,712,872	12,212,052	11,225,545	−986,507
08 Supplies and materials	166,270,763	289,131,701	407,647,964	118,516,263
09 Equipment	21,476,087	49,175,000	43,620,000	−5,555,000
11 Grants, subsidies, and contributions	824,299	733,000	733,000	0
13 Refunds, awards, and indemnities	12,999	159,400	110,100	−49,300
15 Taxes and assessments	83,457	5,029	5,029	0
Unvouchered	76	100,000	100,000	0
Total AEC obligations	829,881,018	1,470,219,084	1,754,952,553	284,733,469
Total obligations under allocated working funds with other agencies	20,287,024	30,287,688	25,447,447	−4,840,241
Grand total obligations	850,168,042	1,500,506,772	1,780,400,000	279,893,228

Mr. MCCARTHY. The information set forth on page 167, Mr. Chairman, consolidates the estimates for personal services, that is for the direct Federal employee employment for all of our programs. Set forth on page 168 is the numbers of personnel which are engaged in each of our various programs.

Mr. CANNON, This is unclassified material?

Mr. MCCARTHY. This is all unclassified, sir. It may go in the record.

Mr. CANNON. You may proceed.

Mr. MCCARTHY. The total personal services cost in fiscal year 1957 was $44,150,000, and is also of course the amount proposed in the language for the personal services limitation for fiscal year 1957.

INCREASE IN PERSONNEL

Mr. CANNON. You tell us, General Fields, that you have increased the personnel here, and you indicate that the increase runs up to 13.7 percent. In other words, you want 13.7 percent more in 1957 than you had in 1955. We had expected the personnel here would be practically stabilized by this time. Do you expect this upward trend to continue and do you think the need for this upward trend is justified? We want to cooperate with you in every way by providing all personnel needed, but of course we would like for your administration to hold down any personnel which is not actually required.

Mr. FIELDS. Yes, sir.

Mr. CANNON. This is a very material increase. Will this upward trend continue or will you eventually reach the point where your forces will be stabilized?

Mr. FIELDS. I would think we would, sir. I do not know at what period we would reach stability. Hopefully it might be in fiscal year 1958. But the major increases are for program direction and administration which we discussed on Friday. It is in this area where the major increase is forecast for fiscal year 1957. This is due largely to our increased activities in promoting the peaceful uses of atomic energy.

Mr. CANNON. Is that any more true of this particular area than any other part of your program? Is that need peculiar to this area?

Mr. FIELDS. Yes, sir; it is due largely to civilian activities, either in this country or in the field of international cooperation, which have increased markedly in this last year. It is in these two areas.

Mr. CANNON. Do you expect it to continue?

Mr. FIELDS. I expect that to continue; yes, sir. As the Chairman indicated in his opening statement, we have some 30 agreements for cooperation with foreign countries. This entails working with them as to their plans, assisting them in the training of their personnel, making arrangements for their coming to this country and working with American industry, so that American industry can sell them products. We are also involved in such matters as dealing with the United Nations, looking toward the establishment of an International Atomic Energy Agency.

In the domestic civilian applications field, there is licensing and regulation of commercial firms which has placed a very large workload on us. In this area also we have the responsibility for the review of hazards and the review of the plants and the procedures they will use. Also the regulations we establish must be enforced. These are the causes for the increase this year in our personnel.

I would hope that the number we forecast in fiscal 1957 may be where we could level off, but our work in these areas is expanding and we cannot at this moment forecast the end of the requirement. There will be a very substantial increase in the workload if those activities are to be promoted. You see, there has been no diminution of our work in the weapons field, in the production field, or in the reactor development field. As a matter of fact, as this budget reflects, these activities are increasing.

Mr. CANNON. You are expanding both in weapon and wartime programs.

Mr. FIELDS. Yes, sir; as well as in the application of the peaceful uses of atomic energy.

MOTOR VEHICLES

Mr. CANNON. Coming down to some of the piecemeals of your work, I note that you are requisitioning coupes. You have coupes with metal extensions. Do you inventory those as automobiles or as trucks? There have been some instances of avoiding the automobile limitation set by the committee. On some coupes agencies would order a metal extension at the rear, and inventory them as trucks when the real purpose was to secure automobiles. What is the situation here?

Mr. FIELDS. I would have to ask Mr. Derry, the Director of Construction and Supply Division.

Mr. DERRY. There are no circumstances that I know of where we have made a modification of passenger vehicles to make them into trucks just to avoid the limitation of appropriation language on the purchasing of automobiles.

Mr. CANNON. An automobile would have been better suited for your purpose.

Mr. DERRY. Where we require trucks we budget for trucks and buy them under that budget. There is one case in Washington where we had a coupe with a box on the back which was bought as a quarter-ton pickup truck. We used it to haul mail between the buildings. This is the only one I know of and it was not done to get away from any limitation on appropriations.

BUS SERVICE BETWEEN GERMANTOWN, MD., AND WASHINGTON

Mr. CANNON. What effect, General Fields, will your move to Germantown, Md., have on your motor vehicle needs?

Mr. FIELDS. It should not have a substantial effect on our motor vehicle needs. We do not anticipate a larger fleet although there may be a requirement for a few more passenger vehicles.

Mr. DERRY. I have a slight forecast on that. We would employ buses for transportation between Germantown and Washington which we would obtain from the General Services Administration interagency motor pool.

Mr. CANNON. How do you expect to establish and operate a regular bus service to Germantown?

Mr. DERRY. It would be for official transportation. Our contemplation is to operate it probably on an hourly schedule. It would operate between Germantown and Government buildings downtown. It would be for transporting official passengers on official business between our headquarters in Germantown and downtown Washington.

Mr. CANNON. Will representatives of the industry meet with AEC personnel?

Mr. DERRY. Representatives of industry are not official visitors and would not be entitled to travel on the bus transportation that we would employ for official transportation. They would have to employ their own cars to get out there, sir.

Mr. CANNON. Economy will be assured by establishment of this service?

Mr. DERRY. In the operation of vehicles; yes, sir.

REFUNDS, AWARDS, AND INDEMNITIES

Mr. CANNON. On page 172 you seem to anticipate a reduction in refunds, awards, and indemnities. Give us a little information on this.

Mr. MCCARTHY. On that particular item, Mr. Chairman, on the refunds, awards, and indemnities, the reduced estimate is the result of a reduction in the payments of claims for damages due to our test operation in Nevada.

(Discussion off the record.)

Mr. CANNON. Mr. Phillips.

BUS SERVICE BETWEEN GERMANTOWN, MD., AND WASHINGTON

Mr. PHILLIPS. I notice when the chairman said that this was an economy measure that none of you answered "yes" to it. I don't think it is an economy measure to have a bus going out there.

Mr. CANNON. I took for granted that silence meant consent. I appreciate Mr. Phillips calling attention to that, and we would like to have a categorical statement on it.

Mr. PHILLIPS. You are not doing it for economy, are you? You are doing it for service.

Mr. DERRY. Transportation, yes, sir.

Mr. PHILLIPS. The Navy runs a bus service which has been somewhat of a problem to us in the past. You see these Navy buses going by this house periodically with about three people in them, a bus big enough to hold 40 people. What you really need is a bus to take the peak load travel, isn't it? The Red Cross runs these little buses.

Mr. FIELDS. We do not contemplate a bus system which would haul people back and forth to work, sir. This is for the purpose of bringing employees to conferences.

Mr. PHILLIPS. Yes, but you say you are going to run this on an hourly schedule.

Mr. FIELDS. Yes, sir.

Mr. PHILLIPS. You mean to say you are going to have enough transportation to justify running buses on an hourly schedule just on the assumption that every hour or so there is going to be somebody who has to go out to Germantown to have a conference? It would seem to me you would do better to have a pool of cars and have them on order or have little buses for surplus or have them come out on a bus line which would then be able to serve the area, and not cost the Government anything.

Mr. FIELDS. We will certainly have to vary that depending on our experience when we get there, sir. It could be that if adequate bus service develops commercially we could reduce our requirement. At the moment, as we see it, the need for conferences with the Department of Defense, the Bureau of the Budget, or such meetings as here, will require bus service.

Mr. PHILLIPS. But you are going to have about four people go over. You are not going to have a group like this every time you have a conference. If you do, you had better get yourself the Detroit equivalent of a little Volkswagen bus or something.

Mr. FIELDS. It is primarily for the conduct of official business with other agencies in Washington, D. C.

Mr. CANNON. You are familiar with the fact that the State Department under practically similar circumstances abandoned this plan some years ago for the reason the gentleman from California emphasized, that it was uneconomical. They had used a bus capable of carrying many people to bring 2 or 3 to a conference intermittently.

Mr. FIELDS. It could work out that this will be our experience. We are forecasting a method of doing it based upon the number of conferences that seem to have to take place daily between our staff and the staff of other agencies. Now, the situation, when we get to it, may be that some other means will be more economic than the operation of buses on a pool basis.

Mr. PHILLIPS. Of course, the testimony was that it was to be an hourly service. Have you made a traffic survey there? It is too early, is it not?

Mr. FIELDS. It is too early.

Mr. DERRY. It will be modified to adjust to circumstances, sir.

Mr. RABAUT. It will be modified to adjust to circumstances and also modified to adjust to the size of the vehicle?

Mr. DERRY. Very much so.

Mr. RABAUT. It will be modified as to the time schedule, too, and modified as to cost?

Mr. DERRY. By operating now with the GSA pool we have access to a variety of types of buses.

Mr. PHILLIPS. That is your opportunity, Mr. Rabaut, that last statement.

Mr. RABAUT. They have good judgment, you know. They have good judgment. They know where to go for buses.

LANGUAGE CHANGES

Mr. CANNON. Turning back to page 8A, at the time we passed over this originally we postponed consideration of the justification for proposed language changes, and we are now reverting to this title in the bill, "Justification for proposed language changes." We will insert in the record at this time pages 8A through 8D of the justifications.

(The pages of the justification follow:)

JUSTIFICATION FOR PROPOSED LANGUAGE CHANGES

OPERATING EXPENSES

Proposed changes in language are indicated as follows: Language enclosed in black brackets indicates proposed deletions and italic indicates proposed insertion of new language.

1. "*purchase of equipment, purchase,* maintenance and operations of aircraft".

The purpose of the proposal to provide for the purchase of equipment, including aircraft, in the appropriation for operating expenses is to simplify the budget process by confining the former plant and equipment appropriation to those items requiring authorization under section 261 of the Atomic Energy Act, since appropriations for equipment do not have to be authorized from year to year as do those for construction projects. The latter appropriation is being retitled to "Plant Acquisition and Construction".

2. "official entertainment expenses (not to exceed [$5,000] *$15,000*)".

This change is required due to the increased emphasis on the nonmilitary programs of the Commission involving international cooperation and industrial participation which, in fiscal year 1957 will occasion more visits to the Atomic Energy Commission installations by distinguished scientists and diplomats from other countries, high government officials including those at the State and local government levels and other important non-AEC persons. The resultant increase in formal contacts will increase the number of formal entertainment functions for which the authorization of $15,000 is requested in fiscal year 1957.

3. "not to exceed [$3,070,000] *$3,350,000* for expenses of travel, including expenses of attendance at meetings of organizations concerned with the function or activity for which this appropriation is made".

This change is in line with the estimated requirements in fiscal year 1957 for expenses of travel as set forth in the detailed estimates.

4. "not to exceed [$38,202,000] *$44,150,000* for personal services".

This change is in line with the estimated requirements in fiscal year 1957 for personal services as set forth in the detailed estimates. The former limitation of $38,202,000 does not reflect the cost of the pay raise granted by Public Law 94, 84th Congress. Provision for an increase of 7½ percent would increase the 1956 limitation to $41,067,000.

5. "*purchase* (*not to exceed three hundred and six for replacement only*) and hire of passenger motor vehicles".

To provide for a limitation on the number of passenger motor vehicles to be purchased in this appropriation similar to the limitations heretofore carried in the prior plant and equipment appropriations. This is in line with the transfer

of the authority for the purchase of equipment to this appropriation. See item 2 above. The number of vehicles to be purchased for replacement reflects a reduction of 173 vehicles from the limitation of 479 in 1956 to 306. The passenger carrying motor vehicle fleet on June 30, 1956, will consist of 2,323 vehicles. Of this number 418 will be disposed of for which replacement is requested for 306. The fleet will be reduced to 2,211 vehicles by June 30, 1957.

6. "[$575,000,000] *$1,740,400,000*, together with [$481,400,000 to be transferred from prior year appropriations under the head "Plant and Equipment", and] the unexpended balances, as of June 30, [1955] *1956*, of prior year appropriations made available under this head".

To delete the transfer provision since no such transfer is contemplated for the fiscal year 1957 and to continue in fiscal year 1957 the provision for the reappropriation of unexpended balances in effect since fiscal year 1950.

7. *"and, in addition, any monies (except sums received from disposal of property under the Atomic Energy Community Act of 1955 (42 U. S. C. 2301)) received by the Commission, notwithstanding the provisions of section 3617 of the Revised Statutes (31 U. S. C. 484)".*

To provide authority for the AEC to apply against its costs of operations receipts which normally would be returned to the Treasury as miscellaneous receipts. At present, AEC must deposit all collections made by itself in the Treasury, but can and does allow its contractors to apply receipts which they collect against costs incurred by them.

The Comptroller General, in a letter to Senator Anderson, chairman of the Joint Committee on Atomic Energy, dated June 2, 1955, reported that AEC's budget and accounting procedures provide adequate control over the receipt and disposition of cash collections by contractors. Contractor collections amount to approximately 85 percent of all AEC receipts. The proposed change would allow the AEC to treat all receipts uniformly except those received under the Atomic Energy Community Act of 1955, which must be deposited in a special fund under the terms of that act.

ADMINISTRATIVE PROVISIONS

1. "Any appropriation available under this *or any other* Act [or heretofore made] to the Atomic Energy Commission may initially be used subject to limitations in this Act during the fiscal year [1956] *1957* to finance the procurement of materials, services, or other costs * * *".

To continue in fiscal year 1957 the provision in effect since fiscal year 1953 with the clarifying revision required since the appropriation for plant acquisition and construction will be contained in a supplemental act.

The clarifying revision *"or any other* Act [or heretofore made] to the Atomic Energy Commission" is required to denote general applicability to the Atomic Energy Commission rather than to any specific appropriation as would be the case if it were not changed. In prior years, the appropriations made to the AEC were contained in the same act. However, pursuant to section 261 of the Atomic Energy Act of 1954, which requires authorization of plant acquisition and construction prior to appropriation, the appropriation for plant acquisition and construction is carried in a supplemental act, thereby requiring the clarifying revision to provide the same authority as was provided in prior years.

Mr. FIELDS. May I ask Mr. McCarthy to review this language?

TRANSFER OF EQUIPMENT TO OPERATIONS

Mr. MCCARTHY. Mr. Chairman, the first change in language would provide for the inserting of the words "purchase of equipment" and "purchase of aircraft" in the operating appropriation. Prior to this year our equipment was purchased under our plant and equipment appropriation. In the Atomic Energy Act of 1954, there was a provision under section 261 which required that appropriations for all construction of the Commission be authorized. Last year we sent forward to the Congress a request for authorization for both our plant construction and our equipment, and it was determined at that time that the equipment was not to be authorized.

Mr. CANNON. How was that understanding reached?

Mr. McCarthy. The Joint Committee on Atomic Energy in its report on last year's bill stated that the authorizing requirement under the Atomic Energy Act pertained only to structures.

Mr. Cannon. Was that a matter of construing the language of the act or was it a setting aside of the provisions of the act?

Mr. McCarthy. It was an interpretation of the language of the act. As a result, we proposed to the Bureau of the Budget this year that our equipment be provided for under the operating appropriation. Many other departments which require authorization for construction, which is set out separately, include equipment in the operating appropriation.

Mr. Cannon. What is the advantage?

Mr. McCarthy. The advantage is that the President could send up in the budget at one time all items for which authorization is not required, leaving for later submission only the plant items which would require authorization prior to appropriation. This change combines into one appropriation all of our requirements except those for the construction which must be authorized. This authorization usually follows at a later date. This language would then provide the authority in the operating appropriation for the purchase of equipment.

Mr. Cannon. There has been general agreement on that point?

Mr. McCarthy. That is correct, sir.

OFFICIAL ENTERTAINMENT

The second item is an increase in limitation. In 1956 the limitation on official entertainment expenses was $5,000. In 1957 we are requesting an amount of $15,000. As a result of the international program and the atoms-for-peace program, the visits of foreign scientists and foreign officials and the requirement for our people to go overseas to discuss the atomic peace program with other nations, there is a larger requirement for entertainment than can be covered by $5,000. In fact, this year it is not adequate.

Mr. Rabaut. Did you have to transfer any funds?

Mr. McCarthy. No, sir, this is a limitation. We have not asked for any increase in limitation.

Mr. Fields. There has been a great increase in the number of conferences and high Government officials who call on us every month on this program. Hardly a week goes by that there are not at least 2 or 3 Government representatives who are here to consult with us on these programs.

Mr. Cannon. The Counsel advises me that a review of the vouchers for official entertainment indicates that in general most expenditures were moderate, and they were for foreign nationals. In isolated instances other Federal employees have been the only persons entertained, that is, they were not foreign personnel, but Federal employees. As a matter of policy do you agree that other Federal employees have the same obligation to work for the United States as the employees of the Commission have, and therefore do not need entertainment to be persuaded to work in their country's behalf?

It may be that these were isolated instances, but there have been such instances, as the vouchers indicate, where the expenditures have been for the benefit of Federal employees.

Mr. FIELDS. I believe these must be isolated incidents because our belief here, as you state, is we do not need a fund of this sort to induce our own personnel or our own citizens to work on this program. Our intent is to utilize this fund for official entertainment for foreign officials, high Government officials and top scientific personnel who visit this country.

Mr. CANNON. That was the intention and expectation of the committee in providing this fund.

Mr. FIELDS. Yes, sir.

LIMITATION ON TRAVEL

Mr. MCCARTHY. The next item, Mr. Chairman, pertains to the limitation for the expenses of travel. In the fiscal year 1956, our limitation was $3,070,000. Our request for 1957 is for $3,350,000, an increase of approximately $280,000.

Mr. CANNON. What is the occasion for that increase?

Mr. MCCARTHY. The occasion is due to two factors. First, of course, it is related to the increase in personnel which we are asking for in 1957, and secondly, to the expanded travel by reason of our people going overseas on visits to foreign nations in 1957.

REDUCTION IN PASSENGER MOTOR VEHICLES

Mr. CANNON. Under item 5 you tell us you are disposing of 418 motor vehicles. We would be glad if you would give us a breakdown reflecting the type, age, and the condition of these 418 vehicles. Will you also give us data as to the type of vehicle you expect to purchase by way of replacement? Are you going to replace these cars exactly as is or have you in mind including in your purchase vehicles different from those which they are intended to replace?

Mr. FIELDS. Mr. Derry, will you provide the answer?

Mr. DERRY. We are disposing of 418 vehicles and we are asking for the replacement of 306 of these.

Mr. CANNON. And you do not expect at a later date to replace the remainder of these 418?

Mr. DERRY. That means that 112 vehicles will not be replaced.

Mr. CANNON. Why have you in the past, with smaller personnel than you will have in the future, required 112 vehicles that you do not now need?

Mr. DERRY. Principally because of completion of construction. Most of the vehicles are coming off the large construction jobs now being completed, at Savannah River, Portsmouth, and Oak Ridge.

Mr. CANNON. Construction is largely completed?

Mr. DERRY. The new capital construction is not of the billion dollar order that we previously had at Savannah River and at Portsmouth. The cars that are being replaced are the ones that have reached the age and mileage limit so that it is no longer economical to maintain them. They are either 6 years old or have run over 60,000 miles. We are replacing them with the standard vehicles that GSA procures for us, that is, a sedan type. There is a limitation on that, as you know.

Mr. CANNON. You will need the remainder of the 418?

Mr. DERRY. We feel we need to replace 306. We had a reduction last year, as you may have noted, and we have had a reduction this

year. Our fleet has been going down, and we have made an effort to further reduce the automotive fleet.

RETENTION OF REVENUES

Mr. CANNON. On page 8B, item 7, you expect that for 1957 this will amount to $33,797,000. In your judgment how large an item would this become in the future, say several years from now, if this practice is continued?

Mr. MCCARTHY. With the community revenue dropping off, as we discussed on Friday, Mr. Chairman, I would expect the total of the item would most likely come down. The extent to which we will be furnishing or selling services to industry is unknown as there is a question as to when industry will build some of these types of plants or facilities and would service themselves. The sale of heavy water to foreign nations may well come down, also.

Mr. CANNON. The committee will stand adjourned until 2:30 this afternoon. We will take up the second book at that time.

AFTER RECESS

PLANT ACQUISITION AND CONSTRUCTION

PLANT ACQUISITION AND CONSTRUCTION, ATOMIC ENERGY COMMISSION

Program and financing

	In budget as amended	Revised estimate	Difference
Program by activities:			
1. Source and special nuclear materials facilities	$69,865,000	$69,865,000	
2. Weapons facilities	75,814,000	75,814,000	
3. Reactor development facilities	116,853,000	140,953,000	$24,100,000
4. Physical research facilities	13,832,000	13,832,000	
5. Biology and medicine facilities	1,138,000	1,138,000	
6. Community facilities	3,920,000	3,920,000	
7. Administrative facilities	1,117,000	1,117,000	
Total obligations	282,539,000	306,639,000	24,100,000
Financing: Unobligated balance brought forward	−138,339,000	−148,339,000	−10,000,000
Appropriation	144,200,000	158,300,000	14,100,000

Obligations by objects

Object classification	In budget as amended	Revised estimate	Difference
10 Land and structures	$282,539,000	$306,639,000	$24,100,000

Mr. CANNON. We will take up the appropriation requiring authorization of the Joint Committee on Atomic Energy. We will consider "Plant acquisition and construction," and will place in the record at this point pages 173 through 178 of the justifications.

(The pages of the justifications follow:)

General Statement for Plant Acquisition and Construction

ESTIMATE OF APPROPRIATION

This book contains the budget estimates for the appropriation "Plant acquisition and construction" as amended by House Document No. 415, 84th Congress, 2d session.

The budget estimates for the appropriation "Plant acquisition and construction" provide for total obligations of $306,639,000 to be funded by (1) a new appropriation of $158,300,000 and (2) the application of $148,339,000 in unobligated balances of prior-year appropriations.

REVISION IN APPROPRIATION STRUCTURE

The appropriation "Plant acquisition and construction" replaces the previous appropriation title "Plant and equipment." The latter appropriation included funds for equipment not included in construction projects, but in fiscal year 1957 funds for this purpose are included in the appropriation for operating expenses. The purpose of this revision is to confine the appropriation for plant acquisition and construction to those construction items requiring congressional authorization pursuant to section 261 of the Atomic Energy Act of 1954, thus simplifying the appropriation process. In acting on the 1956 authorization bill (the first of such bills), the Congress determined that equipment did not require authorization.

RECONCILIATION OF FISCAL YEAR 1957 OBLIGATIONS TO APPROPRIATION AUTHORIZATIONS

The following tabulation shows the obligations to be incurred in fiscal year 1957 against authorizations enacted pursuant to section 261 of the Atomic Energy Act of 1954:

	Amount of authorization	Obligations	
		Prior to fiscal year 1957	Fiscal year 1957
Public Law 506, 84th Cong. (1957 program)	$295,495,000	0	$255,376,000
Amendments to Public Law 506, 84th Cong. (1957 program)	24,100,000	0	24,100,000
Public Law 221, 84th Cong. (Community Act of 1955)	2,683,000	0	2,683,000
Public Law 141, 84th Cong. (1956 program)	269,159,000	$200,676,000	24,500,000
Total	591,437,000	200,676,000	306,659,000
Less estimated revenues	X	X	20,000
Net obligations, fiscal year 1957	X	X	306,639,000

ESTIMATES OF OBLIGATIONS FOR PLANT ACQUISITION AND CONSTRUCTION

The estimates for the appropriation plant acquisition and construction are stated in terms of obligations to be incurred during the fiscal year for each of the AEC's functional programs. The table on the next page summarizes the obligations for each program:

Summary of obligations by program

Program	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Source and special nuclear materials	$159,025,127	$139,329,516	$69,865,000
Weapons	30,104,014	60,563,186	75,814,000
Reactor development	42,385,393	131,653,924	140,953,000
Physical research	13,704,109	34,248,793	13,832,000
Biology and medicine	787,666	6,769,429	1,138,000
Community	3,009,575	8,587,962	3,920,000
Administrative	5,000	9,995,000	1,117,000
Total	249,020,884	391,147,810	306,639,000

FINANCING OF OBLIGATIONS

The following table summarizes sources of funding for the obligations for fiscal years 1955, 1956, and 1957:

	Fiscal year 1955	Fiscal year 1956	Fiscal year 1957
Funds available:			
Unobligated balance at beginning of year	$404,691,532	$755,331,371	$148,339,000
Recovery of prior year obligations	510,254,410	145,503,439	0
Appropriations	110,882,400	259,227,000	158,300,000
Total amount available for obligations	1,025,838,342	1,160,061,810	306,639,000
Less:			
Transfer to operating expenses	0	−571,400,000	0
Comparative transfer to operating expenses	−21,476,087	−49,175,000	0
Unobligated balance at end of year	−755,331,371	−148,339,000	0
Obligations	249,020,884	391,147,810	306,639,000

EXPENDITURES FOR PLANT ACQUISITION AND CONSTRUCTION

Expenditures for plant acquisition and construction for fiscal year 1957 are estimated to be $313 million, an increase of $33 million over the estimate of $280 million in fiscal year 1956. Actual expenditures in fiscal year 1955 totaled $818,660,888. Unexpended balances are expected to decrease from $2,036,075,552, at the beginning of fiscal year 1955 to an estimated $581,424,064 at the end of fiscal year 1957 as shown in the following table which depicts the amounts available for expenditure and the expenditures for each year, and the unexpended balances at the end of each year:

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
Unexpended balance, beginning of year	$2,036,075,552	$1,328,297,064	$736,124,064
Appropriation	110,882,400	259,227,000	158,300,000
Transfer to "Operating expenses"	0	−571,400,000	0
Total funds available	2,146,957,952	1,016,124,064	894,424,064
Expenditures (deduct)	818,660,888	280,000,000	313,000,000
Unexpended balance, end of year	1,328,297,064	736,124,064	581,424,064

HIGHLIGHTS OF CONSTRUCTION PROGRAMS

As shown in the table on page 175, estimates are presented for construction requirements for each of the AEC's functional programs. The highlights of the estimates for each of these programs are:

1. *Source and special nuclear materials.*—Obligational authority required in 1957 for source and special nuclear materials facilities is estimated at $69.9 million, compared with estimated 1956 obligations of $139.3 million and actual 1955 obligations of $159 million.

The fiscal year 1957 estimate includes (1) $20.9 million for modifications and improvements to Hanford production facilities, (2) $22.2 million for additional feed materials plant, (3) $10 million for additional waste disposal facilities at Hanford and Savannah River, (4) $9.6 million for improvements, alterations, modifications, and additions to existing plants to increase production, eliminate health and safety hazards, and reduce operating and maintenance costs, (5) $3.9 million for plant additions and modifications at Oak Ridge, (6) $2.9 million for access roads to uranium sites, and (7) $0.4 million for an ore assay laboratory at Grand Junction, Colo.

2. *Weapons.*—Obligational authority required in 1957 for weapons construction is estimated at $75.8 million, compared with estimated 1956 obligations of $60.6 and actual 1955 obligations of $30.1 million.

The estimate for fiscal year 1957 will provide (1) additional production capacity, (2) laboratory and technical facilities to support weapons research and development activities, (3) replacements and additions to permanent base facilities at

the weapons proving grounds, (4) modification, alterations and additions to weapons storage sites and (5) general plant projects required for the weapons program.

3. *Reactor development.*—Obligational authority required in 1957 for reactor development construction is estimated at $141 million, compared with estimated 1956 obligations of $131.7 million and actual 1955 obligations of $42.4.

The fiscal year 1957 estimate includes (1) $110.7 million for developmental and prototype reactors and test area facilities under the military reactor programs, (2) $27.4 million for supporting civilian power and military reactor programs developmental and technical facilities, and (3) $2.9 million for general plant projects.

4. *Physical research.*—An estimated $13.8 million is requested for physical research facilities in 1957 compared with estimated 1956 obligations of $34.2 million and actual 1955 obligations of $13.7 million.

The estimate for 1957 includes (1) $2.7 million for new research tools and facilities to permit more effective and maximum utilization of existing equipment, (2) $9.6 million for permanent research and engineering facilities to replace inadequate and inefficient temporary facilities, and (3) $1.5 million for miscellaneous improvements and modifications to existing facilities.

5. *Biology and medicine.*—An estimated $1.1 million will be obligated for the biology and medicine program in 1957 as compared with estimated 1956 obligations of $6.8 million and 1955 obligations of $0.8 million.

The estimate for 1957 provides for construction of a reclamation and hot laundry plant at the Brookhaven National Laboratory, and for miscellaneous additions and improvements at the Brookhaven National Laboratory and for general biomedical program requirements.

6. *Community.*—Obligational authority of $3.9 million is required in fiscal year 1957 compared with estimated fiscal year 1956 obligations of $8.6 million and fiscal year 1955 obligations of $3 million.

The estimate for 1957 provides for construction, modification, or expansion of municipal facilities authorized under Public Law 221, 84th Congress, at Oak Ridge, Tenn., and Richland, Wash., at a total cost of $2.7 million; construction of elementary school classrooms, Los Alamos, N. Mex., costing $0.2 million; general plant projects for all communities amounting to $1 million.

7. *Administrative.*—Obligational authority of $1.1 million is required in fiscal year 1957 compared with estimated fiscal year 1956 obligations of $10 million and fiscal year 1955 obligations of $0.5 million.

The estimate for fiscal year 1957 provides office space for the Albuquerque Operations Office costing $0.5 million and for warehouse and work space for the technical information services extension located at Oak Ridge, Tenn., costing $0.6 million. At both operations offices work will consist of alteration and renovation of existing buildings and no new construction is involved.

Mr. CANNON. I understand, General Fields, that you feel that the new title "Plant Acquisition and Construction" is more appropriate than last year's title, "Plant and Equipment," for the reason that funds for equipment that are not included in the construction projects are now classed as operating expenses.

Mr. FIELDS. That is correct, sir.

SOURCE AND SPECIAL NUCLEAR MATERIALS PROGRAM—CONSTRUCTION OBLIGATIONS

Mr. CANNON. We will follow the plan adopted in the previous book and will defer action on proposed language changes for plant acquisition and construction, and take up on page 182 "Construction obligations for the source and special nuclear materials program."

JUSTIFICATION OF THE ESTIMATE

In support of that we will include in the record pages 182 to 186, inclusive.

(The pages of the justification follow:)

PLANT ACQUISITION AND CONSTRUCTION

SOURCE AND SPECIAL NUCLEAR MATERIALS PROGRAM—CONSTRUCTION OBLIGATIONS

Program statement

Estimated obligations, fiscal year 1957	$69, 865, 000
Estimated obligations, fiscal year 1956	139, 329, 516
Actual obligations, fiscal year 1955	159, 025, 127

During fiscal year 1957 $69, 865, 000 will be required for necessary construction activities related to the source and special nuclear materials program.

The requirements for these facilities reflect (1) rapidly accelerated uranium program, (2) need for increased safety in operation of reactors, (3) need for additional waste storage facilities at the reactor sites, and (4) the assurance of continuity of increased production.

JUSTIFICATION OF PROJECTS FOR WHICH FUNDS ARE REQUESTED IN FISCAL YEAR 1957

1. Project No. 57–L–1, offsite access roads, Colorado Plateau and adjacent areas, $2,873,000

This project makes provision for financing the estimated cost of building and improving access roads in Colorado, Utah, New Mexico, Arizona, Wyoming, South Dakota, Washington, and Idaho, to permit the hauling of uranium ores from mines to processing plants and ore-buying stations. In many instances ore deposits are located in accessible areas where mine development and the transportation of ores would be impossible without the construction of access roads. In addition to providing for the construction of new roads, the estimate includes funds for improvements to existing roads necessitated by the fact that roadbeds, bridges, and culverts are not adequate for the movement of heavily loaded ore trucks. This construction is an essential adjunct in attaining the Commission's long-term uranium procurement authorization. It is contemplated that these funds will be transferred to the Bureau of Public Roads.

2. Project No. 57–e–1, analytical laboratory addition, Grand Junction, Colo., $362,000

This project is required to meet the additional analytical workload resulting from the expected material increase in the procurement program in the United States. The addition will be a masonry building of approximately 8,000 square feet, with an 11-foot 4-inch ceiling, concrete floors covered with rubber tile throughout, steam heating, individual fume-exhaust systems for each laboratory room, dehumidification unit for dry balance rooms, and air replacement by evaporative coolers, and low-pressure steam coils.

3. Project No. 57–n, general plant projects, $580,000

This project provides for new ore-buying facilities, where required, and for minor additions, alterations, and improvements to Commission-owned facilities located at Winchester, Mass.; Grand Junction, Colo.; Moab, Utah; Monticello, Utah. Due to the accelerated domestic uranium-procurement program permitted by recent major ore discoveries, it will be necessary to expand, replace, or renew existing facilities which are found to be inadequate. Examples of the type of work contemplated hereunder are enlarged storage, maintenance, service, and repair facilities at Grand Junction; reclamation of swampy lands to provide storage area within the Grand Junction compound; a garage and storage-facility addition at the Raw Materials Development Laboratory at Winchester; etc.

4. Project No. 57–a–1, additional feed-materials plant, $22,200,000

This project provides for the addition and expansion of feed-materials processing and related service facilities required to process the increased supplies of uranium ore for program needs. The ultimate selection of site and design within the scope of capacity required has not been determined.

5. Project No. 57–a–8, chemical-processing facility, St. Louis, Mo., $1,600,000

The funds requested for this project are to provide for the construction of a residue-processing plant, and to economically recover quantities of uranium not recoverable in the existing production process at the Mallinckrodt Chemical Works, St. Louis, Mo.

6. Project No. 57–a–9 barrier plant automation, Oak Ridge, Tenn., $1,400,000

This project provides for modifications and additions to the existing barrier production facilities to achieve a greater degree of automatic operation. These modifications to the plant will enable the reduction in processing costs through the reduction of personnel more efficient processing, and less breakage of barrier.

7. Project No. 57–a–12, fuel element heat-treating facility, Fernald, Ohio, $500,000

Funds requested for this project will provide for a heat-treating facility that will produce fuel elements of superior performance.

8. Project No. 57–a–13, renovation of service plant, Oak Ridge, Tenn., $450,000

The work proposed in this project consists of the renovation and improvement to certain service facilities in the Y–12 area. The existing electroplating facilities will be retired and new modern facilities will be more efficiently located. A reclamation facility to be located in an existing building will economically recover materials from previously discarded wastes. The present electrical maintenance shops will be rearranged to provide the installation of additional facilities and to improve the speed and economy of services rendered by the maintenance groups.

9. Project No. 57–a–2, improvements to reactor instrumentation, Hanford, Wash., $8,000,000

This project covers additions and improvements to the instrumentation and controls of the reactors to support increased production capacity and to support the maintenance of adequate safety of reactor operation at increased production rates.

10. Project No. 57–a–4, reactor facility safety improvements, Hanford, Wash., $5,000,000

It is proposed to install improved and additional reactor equipment in the Hanford reactors to provide for increased operating safety.

11. Project No. 57–a–5, additional waste disposal system, Hanford, Wash., $5,000,000

This project provides additional disposal facilities for radioactive wastes generated by the separations plants.

12. Project No. 57–a–6, charging and discharging system, Hanford., Wash., $3,450,000

This project covers the installation of special equipment on a reactor.

13. Project No. 57–a–7, modifications of existing production facilities for increased efficiency and safety, Hanford, Wash., $3,000,000

This project provides for the design, procurement and installation of new and altered equipment and structures to improve the processing efficiency, process capacity and safety in the various production plants.

14. Project No. 57–a–10, reactor temperature test installation, Hanford, Wash., $900,000

This project proposes facilities for an experimental test directed toward operation of the reactors at increased outlet temperature.

15. Project No. 57–a–11, improvements to reactor cooling water effluent system, Hanford, Wash., $550,000

It is proposed to make modifications and additions to the reactor cooling water effluent systems to assure production continuity, improvements in plant efficiencies, and increases in irradiation capacity.

16. Project No. 57–a–3, improved high level waste handling system, Savannah River, $5,000,000

This project provides facilities for handling additional accumulation of wastes at Savannah River including storage tanks, a pumping station and waste volume reduction facilities.

17. Project No. 57-n, general plant projects, $9 million

This project consists of many miscellaneous improvements, alterations, additions, and retirements, including minor new construction. It is estimated that $9 million will be required for such work in fiscal year 1957 in order to provide for the continuity of operations, improvements in production techniques, elimination of health hazards, and reduction in operating costs in the various production

processing and supporting facilities of the special nuclear materials program. Obligations in fiscal year 1956 will be $7,226,280.

Many of the items contained herein are recurring in nature and funds are requested on the basis of past years' experience. Funds are also required for projects that can be specifically identified on the basis of process improvements, technological advances and experience gained from startup operations. The balance of the estimate is to cover the many items that cannot be specifically identified at this time, although the need for similar items develops during each year's operation.

The estimate for fiscal year 1957 is less than 1 percent of the capital value of all special nuclear materials plants located at the various sites under the Oak Ridge, Hanford, and Savannah River operations offices.

The amount requested for each operations office is as follows:

Operations office:	*Amount*
Hanford	$2,000,000
Oak Ridge	5,200,000
Savannah River	1,800,000
Total	9,000,000

GENERAL STATEMENT

Mr. CANNON. Now will you give us your views on the progress of this program?

Mr. FIELDS. Yes, sir. In the source and special nuclear material program we are estimating construction requirements for 1957 in the amount of $69,865,000. That is substantially less than the fiscal 1956 requirement of $139,329,516.

These requirements are needed because of the accelerated raw materials program and for other reasons to insure continuity and increased production.

(Discussion off the record.)

There are 17 projects in this program in fiscal year 1957. The first of these is the project for offsite access roads on the Colorado Plateau and adjacent areas, in the amount of $2,873,000.

This is for assistance in the construction and improvement of access roads in those areas to provide a means for the ore to be delivered from the mines to the buying stations and mills. The estimate is for approximately 299 miles of road construction and for improvements. The funds would be transferred to the Bureau of Public Roads of the Department of Commerce to accomplish this. We have had similar programs in the past, since 1950.

OFFSITE ACCESS ROADS, COLORADO PLATEAU AND ADJACENT AREAS

Mr. CANNON. You speak of offsite access roads. Distinguish between access roads and offsite access roads?

Mr. FIELDS. These do not include roads on any of our own production sites or on sites of our other facilities, sir. These are roads in the States of Utah, Colorado, New Mexico, Arizona, Wyoming, South Dakota, and Washington, which are needed to open up the areas so that the ore can be delivered from the mines.

They are for areas where there are no roads. They are just trails or they may be unimproved roads where, because of the large tonnages to be hauled over them, improvements to culverts and bridges are required in order that we can take out ore from the new sources that have been developed.

Mr. CANNON. You ask $2,873,000 for off-site access roads. We have been told that the States and counties assume all maintenance cost after construction of improvements is completed, and that plan has been in operation for the last several years. Has that operated successfully, and is there any instance in which through lack of maintenance you will be required to make additional capital expenditures?

Mr. FIELDS. May I ask Mr. Johnson, who is the Director of our Raw Materials Division, to answer that question, sir?

Mr. JOHNSON. Mr. Chairman, the road program has been in effect since 1950 when Congress by special legislation in an amendment to the Federal Highways Act, provided funds for access roads to mines.

Mr. CANNON. Didn't we have an understanding prior to that time, that the counties or the States in which these roads were constructed would take over the roads and maintain them?

Mr. JOHNSON. I am not certain as to that, sir, but I do know this, that the Commission has requested the Bureau of Public Roads to obtain the maximum contribution from counties and States in connection with both the construction and the maintenance of the roads, and this resulted in the agreement that the counties would handle the maintenance under the access road program.

Mr. CANNON. The counties or States or both?

Mr. JOHNSON. In part both. The county roads are maintained by the counties. The State roads are maintained by the States. The States have also agreed under an informal agreement worked out by the Bureau of Public Roads, to apply to maintenance and construction at least as much funds as the revenue the States derive from the haulage of the material over the roads.

Mr. CANNON. What has been the extent to which the States or the counties have kept their agreements to maintain these roads?

Mr. JOHNSON. They have kept them reasonably well.

Mr. CANNON. There has been no neglect of maintenance that would require reconstruction?

Mr. JOHNSON. No, but there are roads that have had to be reconstructed as a result of greatly increased traffic over the original road.

On going into a new area, the road costs are kept to a minimum, and if the areas develop into large producers, the original construction may be entirely inadequate to take care of the traffic.

Mr. CANNON. That would not be a matter of maintenance.

Mr. JOHNSON. That would be reconstruction. We have had the improvement of existing roads.

Mr. CANNON. Who decides where maintenance ends and construction begins?

Mr. JOHNSON. That is worked out primarily between the Bureau of Public Roads, the counties, and the States. We have felt that they are in the best position to deal with the State highway engineers and counties in view of the large operations that the Bureau of Public Roads has in connection with Federal-aid to highways throughout the country.

Mr. CANNON. In what sections of the country have you found construction of roads, adequate at the time, has been so affected by increased and unexpected volume of traffic as to make reconstruction necessary?

Mr. JOHNSON. That has happened in the States of Colorado and Utah, particularly. Those are the two States where this has been a major item in the past.

Mr. CANNON. And what mileage would you say had been affected?

Mr. JOHNSON. I am not in a position to give you the details for the period except in connection with the present budget of $2,873,000 of which $1,465,000 represents improvements to 106 miles of existing roads.

ROAD USERS' REVENUES

Mr. CANNON. You spoke of road users' revenues before the Joint Committee on Atomic Energy. What is indicated by road users' revenues?

Mr. JOHNSON. I was referring to the revenue that the States receive from the use of the roads such as gasoline taxes and revenues of that kind.

Mr. CANNON. I would like to have a little more information on that. Road users' revenues—what revenues are derived from these roads except use of the road?

Mr. JOHNSON. I probably misstated it if I said road users' revenue. I had in mind the revenue derived by the States from the use of the roads and that is largely, I believe, revenue from the gasoline taxes. The States have agreed to apply to the maintenance of these roads an amount equal at least to that which they have derived from the tax revenues from the use of the road.

Mr. CANNON. Would the term be a reference to taxes which are levied in order to carry out this agreement as to maintenance?

Mr. JOHNSON. I believe there are no special taxes for the maintenance of these particular roads. I believe the revenue comes from the gasoline taxes, plus the proportionate share of Federal-aid highway funds that are applied to some of these roads.

Mr. CANNON. That would hardly be revenue.

Mr. JOHNSON. That would not be revenue. The revenue, as I understand it, is the tax on the gasoline that is collected by the States from the traffic that moves over the roads.

Mr. RABAUT. Could I ask a question, Mr. Chairman?

Mr. CANNON. Mr. Rabaut.

Mr. RABAUT. How do they arrive at that tax?

Mr. JOHNSON. It is the normal State gasoline tax.

Mr. RABAUT. I know the tax, but how do they arrive at what the traffic is over the roads?

Mr. JOHNSON. There have been surveys by the Bureau of Public Roads, including a sampling of traffic over the roads. I am not certain as to what other surveys are made. I do know that the Bureau of Public Roads has conducted surveys on the amount of traffic on the various important roads.

Mr. RABAUT. There is no return of any Federal tax; is there?

Mr. JOHNSON. No, sir.

Mr. RABAUT. Just State tax?

Mr. JOHNSON. Yes, sir.

Mr. RILEY. Are most of these roads asphalt?

Mr. JOHNSON. In mileage most of them are not. There are some roads which are blacktopped where the traffic is particularly heavy and where a gravel base would be wrecked within a short time.

Mr. RILEY. Most of the asphalt roads have a gravel base with a binder of asphalt.

Mr. JOHNSON. That is correct, sir.

Mr. RILEY. If the surface wears thin, but the base is sound, you can come back and put another inch or two of asphalt on it and have a new road. I imagine that is what you mean by new construction; is it not?

Mr. JOHNSON. In some cases that is true. There are other cases where the roadbed itself was rather primitive at the start because of an inability to accurately forecast the amount of traffic over the road. I would like to point out that the way this business has moved out there, in 1948 there was only a very small amount of ore moved from the mines to the mills over these roads. In the current fiscal year there will be many times that amount and that amount will be greatly increased over the next several years. This traffic has built up suddenly as a result of the ore program in very sparsely settled areas.

Mr. RILEY. I imagine that the transportation equipment has increased in size and weight, too, so that you have to have a heavier roadbed.

Mr. JOHNSON. That is true, and it has been the concern of both the States and the Bureau of Public Roads in watching the size of the trucks. There are limitations on the amount of load that a truck may haul but there are always attempts to overload.

ANALYTICAL LABORATORY ADDITION, GRAND JUNCTION, COLO.

Mr. CANNON. You have an analytical laboratory at Grand Junction. What is the function of that laboratory?

Mr. JOHNSON. It is entirely a matter related to the purchase of the uranium ores by the Commission, or the purchase of uranium concentrates produced by the mills in the area.

Mr. CANNON. I note there is no commitment for the purchase of vanadium after March 1962. What effect will that have on the volume that will be handled by that laboratory?

Mr. JOHNSON. It will have no major effect. The big effect of the increase in the workload of that laboratory is the increase in the amount of uranium being purchased. In fiscal 1957 it is estimated much more uranium will be purchased, and this material must be sampled and assayed by the laboratory for the purpose of determining payments for ore.

Mr. CANNON. The gentleman from California, Mr. Phillips.

OFF-SITE ACCESS ROADS, COLORADO PLATEAU AND ADJACENT AREAS

PROPORTION OF TOTAL ROAD COSTS REPRESENTED IN ESTIMATES

Mr. PHILLIPS. I am not sure that I understood the proportion of the total cost of the roads represented by $2.8 million. You said that this was our share, I think. What proportion of the total cost of the roads does the United States put up? Is it a regular formula or is it different in each instance?

Mr. JOHNSON. For fiscal 1957 in addition to maintaining the roads, the State of Colorado will contribute about $185,000 on the roads that are listed in the budget and Utah, about $243,000, or a total of $428,000. That is for the construction, improvements, and maintenance of the trunklines.

Mr. PHILLIPS. Why should not the State share of it be more than that?

Mr. JOHNSON. I can only say, sir, that we have had our own people talking to State road officials, and we have written the Bureau of Public Roads to get the maximum possible contributions toward these roads.

Mr. CANNON. You mean they were better traders than you were?

Mr. JOHNSON. I think it boils down to this: That these roads are essential to our operations. They must be taken care of. The funds have to be put up either by the local governments, the State government, or the Federal Government.

Mr. PHILLIPS. The State governments have more money than the Federal Government.

Mr. JOHNSON. We have been unable to get any more contributions. I think that is the only answer I can give, sir.

Mr. PHILLIPS. General Fields, somewhere very dimly I have a recollection that some of these prices we paid for ore contemplated the assumption of such charges—this might be one, roads—that we were paying a high cost for ore under the assumption they were going to underwrite certain expenses, one of which I think would be the access roads. Do you remember anything like that?

Mr. FIELDS. No, sir, I don't recall anything like that.

Mr. PHILLIPS. There is something very dimly in my mind as to that.

Mr. JOHNSON. I am not sure but you may be referring to the haulage allowance that is paid to the miners. There is in our price, a haulage allowance of 6 cents per ton-mile on the ore.

Mr. PHILLIPS. Who gets the benefit of that if we put up $2.8 million for the roads?

Mr. JOHNSON. That partially pays the cost of trucking the ore from the mines to the mills.

Mr. PHILLIPS. Pays whom?

Mr. JOHNSON. It goes to the miner. The miner must mine his ore and then he sells it.

Mr. PHILLIPS. He pays for the truckage with no respect to the road.

Mr. JOHNSON. With no respect to the road.

Mr. PHILLIPS. How much does the trucker pay toward the cost or upkeep of the road?

Mr. JOHNSON. He pays the State gasoline taxes. I am not sure whether there are special taxes on the trucks, but I think he pays the standard tax that is paid by any trucking operation within the State.

Mr. PHILLIPS. You do not think you should know what the taxes are if you are engaged in a bartering situation with a State as to how much they were going to put up for the road, that you should know what the taxes were?

Mr. JOHNSON. It is the gasoline taxes and they vary from State to State. I believe also it is the normal tax.

Mr. PHILLIPS. You are not dealing from State to State. We are dealing with Colorado and Utah—two States. Colorado has put up $188,000 and Utah has put up $243,000 out of $2,873,000. That makes the cost of blacktop eleven or twelve thousand dollars a mile. What is the average cost of rolling down a blacktop road in our Western States?

Mr. CANNON. Will the gentleman permit? What is the character of the terrain there?

Mr. PHILLIPS. It would be hilly, dry forest soil.

Mr. CANNON. It would require some engineering?

Mr. PHILLIPS. I think that would be a good question, Mr. Chairman. How much of this would require heavy construction work in preparation for putting in the road? These were just cow trails in some instances. Nevertheless, you can roll them flat, most of them, until you get in the mountains, and roll down a desert mix. That is all you are doing. You are not putting any base under them.

Mr. JOHNSON. In many cases they start as gravel roads. Many of them continue that way. In other cases they are blacktopped where there is particularly heavy traffic.

Mr. PHILLIPS. All right. But say $12,000 a mile, that is just oil and slag rolled together, and they roll it over and over, and then put that on the road. It is a common method. It is one of the methods by which we have been able to pave the western roads more extensively than it was possible to do before with the discovery of the use of desert mix, as we call it out our way. I do not think that you are doing such an economical job on any evidence that you are testifying to today, do you?

Mr. JOHNSON. The construction of the roads and the engineering of the roads is done on the basis of the determined estimates of the load. It is done by the Bureau of Public Roads.

Mr. PHILLIPS. They are paying for that.

Mr. JOHNSON. Yes.

Mr. PHILLIPS. Out of separate money.

Mr. JOHNSON. Yes.

Mr. PHILLIPS. In other words, all you have here is the net cost of a desert mix presumably, no engineering, and you have collected only $400,000 from the States that are benefiting by it. That is one-seventh. That is 14 percent. We are paying 86 percent and the 2 States together are paying 14 percent.

Mr. JOHNSON. Many of the roads, of course, are county roads.

Mr. PHILLIPS. Every county in the West has complete road equipment. They can roll this out. Did you count that?

Mr. JOHNSON. The counties are maintaining the roads after they are built.

Mr. PHILLIPS. You mean you gave them an allowance of 86 percent on the basis of what they would have to do to the road in the future?

Mr. JOHNSON. Probably we should not, but we have been relying on the Bureau of Public Roads as being the qualified organization to determine the type of roads that should be built for a specific traffic, taking into consideration the territory. The Bureau of Public Roads, under a congressional authorization, handled all the construction and requested funds in its own budget following the congressional law of 1950. Later the Department of Commerce thought that since this was for the particular benefit of the Atomic Energy Commission we should request the funds in our own budget. We have continued to use the Bureau of Federal Roads, as was done when the Department of Commerce requested funds.

Mr. PHILLIPS. We have never had a better administrator than the old Scotsman who ran the Bureau of Public Roads. It is you asking for $2,870,000, not he.

Mr. JOHNSON. We do not have on our staff highway engineers. For that reason, and because the Bureau of Public Roads has carried on this very same program for 3 years prior to ours, we only determine by surveys the amount of traffic which would come out of an area and have requested the Bureau of Public Roads to do the engineering work and to determine the type of road that should be built.

Mr. PHILLIPS. That is all, Mr. Chairman.

ANALYTICAL LABORATORY ADDITION, GRAND JUNCTION, COLO.

OPERATION OF THE ASSAY LABORATORY

Mr. CANNON. Supplementing what you have said on the laboratory, what method is employed in selecting the contractor who operates this laboratory?

Mr. JOHNSON. The contractor now operating the laboratory was selected on the basis of replies to a request for proposals. The proposals were reviewed, and a selection then was made of the best qualified organization submitting proposals.

Mr. CANNON. Who decided which was the best qualified applicant?

Mr. JOHNSON. A committee of our Grand Junction operations office in collaboration with our Washington staff.

Mr. CANNON. Other than the contractor's manager, all of these other employees are paid by the AEC?

Mr. JOHNSON. Yes, sir.

Mr. CANNON. And they are all civil-service employees?

Mr. JOHNSON. No; they are the contractor's employees.

Mr. CANNON. But you pay them.

Mr. JOHNSON. Yes.

Mr. CANNON. What is your estimate as to what the contractor derives from this contract as a profit after deducting the salary and the administrative costs or the indirect administrative costs?

Mr. JOHNSON. The contract fee is $58,000 a year, I believe, and the local manager's salary is I believe about twelve or fifteen thousand dollars. The contractor bears the cost of the auditing service by the home office of the company, and the inspection and general management furnished by the home office of the contractor. There is no reimbursement allowed for home-office activities. The amount of business this contractor does per year of about $150 million involves determinations on the assays. There is a heavy responsibility in handling the laboratory. The fee is not only for the laboratory, but it is also for the operation of ore-buying stations and the disbursement of funds for the ore purchased at the ore-buying stations.

Mr. CANNON. The lump sum involved has not varied from year to year in the last few years?

Mr. JOHNSON. No, sir. We have had a new contractor within the last year. In 1948 we employed the American Smelting & Refining Co. as our contractor to set up the ore-buying stations and laboratory. The American Smelting & Refining Co. did not want a fee. They merely wanted an allowance which they estimated would be adequate to take care of some of the home-office expenses of about $15,000 a year. On top of that we paid for the manager in addition to the other employees of the contractor.

Mr. CANNON. Has the change in manager and in general method employed, involved additional expense?

Mr. JOHNSON. It has involved additional expense. I think I am correct in saying that it was $18,000 a year paid to the contractor as a fee and $12,000 for the manager's salary, making a total of $30,000 as against the present contract of $58,000. But the original contract was a contract with a very large company, and they did not want to have any profit in the operation.

Mr. CANNON. That would seem to be a reduction. You say from $58,000 down to $30,000?

Mr. JOHNSON. No, the present one is $58,000. Previously the cost would have been about $30,000.

Mr. CANNON. That seems to the committee to be a rather substantial increase. We wonder why an increase was warranted. Will you place in the record at this point as part of your testimony the tabulation involved?

Mr. JOHNSON. That is, furnish it for the record?

Mr. CANNON. The change in the cost of this service in connection with the change in managements.

Mr. JOHNSON. Yes.

(The information follows:)

SELECTION OF LUCIUS PITKIN, INC., ORE-BUYING CONTRACTOR

American Smelting & Refining Co. was engaged as an ore-buying contractor when our domestic uranium program was established early in 1948. The company was prevailed upon to take the operations as a public service. It received no fee except for a payment estimated to cover actual expense at the home office in supervising the contract. Originally the home office allowance was [$1,250 per month and later increased to $2,000. The contract contained a provision which restricted the company from undertaking uranium operations for its own account on the Colorado Plateau. In late 1954 American Smelting & Refining Co. stated that it would like to withdraw from the contract on the basis that it had made an ample contribution to the program and that the time might be approaching when it would like to be free to undertake uranium mining operations for its own account. The company was prevailed upon to continue operations through December 31, 1955.

In October 1955 a press release was issued inviting proposals from qualified organizations interested in undertaking the contract. Eight firms submitted proposals accompanied by brochures setting forth qualifications and experience. Proposals were reviewed by an evaluation committee and selection was narrowed to three firms, which were visited and interviewed.

Lucius Pitkin, Inc., was selected on the basis of lowest fee, organization, experience, and services offered.

The annual fee to be paid is $58,800. It is intended to compensate the contractor for home office administration and overhead, and profit. The fee includes the salary cost of the project manager which formerly was reimbursed to the operating company at an annual cost of $15,444. Under the contract with the American Smelting & Refining Co., in addition to the annual home office allowance of $24,000, the Commission reimbursed the project manager's salary costs of $15,444, making a total of $39,444.

The responsibilities of the contractor include the weighing, sampling, assaying, and purchases of uranium ores and the sampling and assaying of uranium concentrates for purpose of payment. The total value of these products to be handled by the new contractor will be greatly increased as a result of the expansion of domestic uranium production.

ADDITIONAL FEED MATERIALS PLANTS

Mr. CANNON. You are asking for $22,200,000 for the additional feed-materials plant.

Mr. FIELDS. Yes, sir.

Mr. CANNON. Your need for that seems to be dependent on the type of response you get from industry. If private companies will

submit satisfactory proposals by this coming October, you will not need additional facilities.

Mr. FIELDS. We will not need the additional facilities. There would, however, be a requirement for funds to be obligated against the contracts, sir. When we come back to discuss the language, you will note that we are requesting the committee to appropriate this amount of money for the construction of this facility at Government expense, and to authorize the transfer of that money to the operating budget to let long-term contracts with industry if we obtain satisfactory proposals. We would require the transfer so that there would be funds in the operating appropriation to obligate for the long-term commitments involved.

Now, with the increased ore supply, we do have a need by the start of fiscal 1959 for additional feed materials processing plants. These plants take the uranium from the mines after it is concentrated in the mills. They then refine it so as to separate the uranium and to form that uranium either into metal or into uranium hexafluoride. The metal is used in our reactors in the production process and the uranium salts would go to Oak Ridge for the gaseous diffusion plant. Because of the increasing availability of raw materials, our load requires that we have additional feed materials processing plants by fiscal 1959.

The intent is to attempt to get industry to build the facilities to do this. We have asked for proposals to be submitted to us by October 1 of this year. We have had numerous conferences at which there has been considerable interest expressed by industry in following this route by providing processing plants to accomplish this purpose. We are hopeful that industry would pick it up. However, this would have to be under contracts with the Commission for operating the plants over a period of time.

Mr. CANNON. How many companies do you expect to submit proposals? How many could reasonably be expected to apply?

Mr. FIELDS. I do not have a feel for this at the present time. We do know that 15 or 20 companies have come to the conferences, and are studying the information on the feed materials process. I think that 4 or 5 of them are seriously considering proposals.

Mr. CANNON. Sufficient, you think, to obviate the need of the additional facilities we were talking about a while ago?

Mr. FIELDS. We won't really know until we see the proposals in October, sir.

Mr. CANNON. That depends not only on the number that submit proposals, but on the nature of the proposals.

Mr. FIELDS. It will depend on the nature of the proposals they submit. It may be that it would be cheaper for the Government to build and operate the facility.

Mr. CANNON. Now, feed material—is that a technical term?

Mr. FIELDS. Yes, sir; it is a vernacular term that has grown up in our activities. It is that part of the process—the point from where you take the concentrated ore and then refine it, purify it, separate the uranium, and then form it into metal or form it into the salt to feed into the gaseous diffusion plant. It is then in an entirely different form than when you buy it as a raw material.

Mr. CANNON. In the event you do not get sufficient proposals, or if the propositions submitted are not satisfactory, and you finally have to provide these additional facilities, who will operate them?

Mr. FIELDS. We would operate them by contract with some industry. If the Government built the facilities, we would enter in a contract for their operation.

Mr. CANNON. Would you operate under the contract or would you make a contract for them to operate under?

Mr. FIELDS. We would make a contract with industry to operate them for us, just as we do for the present feed materials plants.

Mr. CANNON. You anticipate no difficulty in finding somebody?

Mr. FIELDS. No, sir; we do not. You see, all our production facilities are operated by contractors. We operate no production facilities, directly, ourselves.

CHEMICAL PROCESSING FACILITY, ST. LOUIS, MO.

Mr. CANNON. The chemical processing facility at St. Louis is operated by Mallinckrodt, a firm with facilities in many parts of the country.

Mr. FIELDS. It does have and they operate a feed materials plant for us in St. Louis at the present time. Now, the particular requirement there is for a process facility to handle certain residues that come from the other operations which the present facilities are not capable of handling for one reason or another. We had been unable to develop a process to separate the material with these impurities in it. Now, we have developed a process which can do this, and in order to recover that uranium and certain other special materials in it, we do need the addition to the plant, in order to accomplish this new purpose.

Mr. CANNON. Previously, they have been handling this work for you at a unit price. Now, you seem to be changing to a cost-plus-fixed-fee price. That is a plan we have found highly objectionable, an expedient which we thought we would have to resort to only in case of emergency or war. Why have you changed your contract with the Mallinckrodt people from a unit-cost basis to a cost-plus-fixed-fee?

Mr. FIELDS. May I ask Mr. Bloch to answer that question?

Mr. CANNON. We have had to pay some enormous amounts on some of these cost-plus-fixed-fee propositions and have found it an uneconomical method. It is especially wasteful in construction and one for which it seems to me there is no occasion except in time of war or working under emergency conditions.

Mr. BLOCH. Mr. Chairman, we have had difficulties in operating this facility at St. Louis on a unit-price basis because of the changing character of the feed materials, our inability to set a firm specification as to what ore should be delivered for them to process, and our inability to guarantee them a particular quantity of feed material. The old contract provided that the unit price would be renegotiated every 4 months or within the 4-months period if there was a deviation of more than 5 percent in the quantity of material or in the specification of the ore delivered to them. That would be a basis for renegotiation, too. So it was not a unit price in the true sense. It involved many adjustments as you went along.

We are now faced with an unstable period for the next several years. In addition to operating the existing facilities, we will be bringing in the new plant at Weldon Springs which this same company will operate. So we won't have a stable period of operation in terms of quantity of material to be processed until 1959, when it appears we

will have all the facilities in and have the operation pretty well stabilized.

Therefore, it seemed from the standpoint of cost and administration it was more practical to place this contract on a fixed-fee basis for the next several years.

Mr. CANNON. Are you taking precaution to protect us against undue waste, the use of unnecessary material, and the employment of surplus labor, for the purpose of building up cost and thereby building up the contractors' fee?

Mr. BLOCH. No, sir. The fee is fixed at the outset of the contract based upon the projected operation. There is no provision for changing that fee, no matter how the costs may vary, unless there is an actual change in the scope of the operation. This is in line with our fixed-fee policy. We pay a fixed fee for a certain scope. We do not reward the man for increasing cost. The fee is adjusted only when there is a significant change in scope of the facilities to be operated.

Mr. CANNON. You do not generally proceed on a cost-plus-fixed-fee basis, do you?

Mr. BLOCH. All of our major production plants are operated by contractors under cost-type contracts.

Mr. CANNON. Where are those contracts located, generally speaking?

Mr. BLOCH. There is the one for the St. Louis plant and the Fernald plant at Cincinnati, Ohio. There is the Hanford Engineering Works in the State of Washington, the Oak Ridge operations in Oak Ridge, Tenn., the Savannah River operations near Aiken, S. C., the Portsmouth plant near Portsmouth, Ohio, and the Paducah plant near Paducah, Ky.

Mr. CANNON. Are you operating all of those on a cost-plus-fixed-fee basis?

Mr. BLOCH. They are all on a cost-plus-fixed-fee contract except the Du Pont, the Savannah River plant, which is operated by Du Pont on a cost basis with a fee of $1.

Mr. CANNON. Have you looked into the relative expense of operating on a unit-cost basis instead of a cost-plus-fixed-fee basis?

Mr. FIELDS. We have operated on this basis since the inception of the Atomic Energy Commission, largely because the programs have been changing and it is difficult to arrive at a unit price basis on most of our operations.

Mr. BLOCH. Currently the unit cost for most products are quite comparable. I do not have the exact information, but I can supply that.

Mr. CANNON. You may supply that.

(The information is as follows:)

MCW v. FERNALD

Comparison of unit cost of production, 3d quarter, fiscal year 1956

[Average for quarter, based on an index of 100 for Fernald costs]

Product	Fernald	MCW
Ore to orange oxide (per pound)	100	91.5
Orange oxide to green salt (per pound)	100	66.7
Green salt to derbies (per pound)	100	89.0
Derbies to ingots (per pound)	100	145.2

RENOVATION OF SERVICE PLANT, OAK RIDGE, TENN.

Mr. CANNON. Your project No. 57a–13, in the justifications you say that the existing electroplating facilities will be retired. Do you mean by that that they will be scrapped or replaced? Is it an essential or is it merely desirable?

Mr. BLOCH. It is an essential. The electroplating facility does electroplate work on all types of equipment required for the plants in the Oak Ridge area.

Mr. CANNON. Why are you retiring the electroplating facilities there?

Mr. BLOCH. The facilities we have been using were built during the war. They are in a temporary building. The great bulk of the equipment is old and corroded and the maintenance costs are becoming excessive. Therefore, as a matter of economy we feel that we can make money by replacing these old temporary facilities with a new facility that can be laid out and operated efficiently.

Mr. CANNON. It is not a matter of duplicating present facilities? It is not a matter of providing that this work shall be done by an outside contract?

Mr. BLOCH. No, sir; it is impractical to have this work done outside. A good part of the work is on contaminated equipment.

GENERAL PLANTS PROJECTS

Mr. CANNON. For project No. 57–n you are requesting $9 million for miscellaneous projects, many of which, as you say, "cannot be specifically identified at this time." You say that this amount represents less than 1 percent of the capital value of the plants. I take for granted this is a part of the $69.8 million requirement for alteration.

Mr. FIELDS. This is a part of that $69 million, sir.

Mr. CANNON. How do you propose to spend this $9 million?

Mr. FIELDS. Mr. Chairman, we budget as a specific project, for an item which will cost more than a half million dollars. Now, in our activities, which is really a large manufacturing business in the production of special nuclear materials, we have plant investment of about $4.7 billion. There are certain miscellaneous construction projects with respect to that which have to go forward from time to time, which are either for minor process improvements, or they may be for safety reasons, for the efficiency of the operation. This category is to cover projects which would cost less than a half million dollars and in no case would they involve a building which would cost over $100,000. This is the criteria on which the authorization was secured. It is for the miscellaneous projects that are necessary throughout the year for the conduct of production operations.

We have experienced with this throughout the years which indicates that this is the only way in which these manufacturing activities can go forward efficiently. Perhaps Mr. Bloch can give you a specific example of some items.

Mr. CANNON. Briefly, Mr. Bloch, give us the general idea.

Mr. BLOCH. There are items like this based on our past experience; modifying an overhead crane reel and hoisting a cooling tower in a plant; air-contamination control in a process building where we have experienced unexpected difficulty, and facilities for recovery of uranium from one of the residues coming out of the refinery.

Mr. CANNON. Such instances as that will require the $9 million, or are you just naming a figure here which you are certain will be ample?

Mr. BLOCH. Sir, it is our best judgment, based on our past experience and the size of the plant that we now have, that about $9 million will be required for next fiscal year.

Mr. CANNON. Could you expect to save any of that $9 million?

Mr. BLOCH. We won't spend it unless we have to. Each one of the expenditures under this category are specifically submitted to each of our managers, and reviewed and approved. If they are over $50,000, they are submitted to my division for my approval.

WEAPONS PROGRAM—CONSTRUCTION OBLIGATIONS

Mr. CANNON. We will turn to page 195, to the construction obligations for the weapons program. We will include in the record pages 195 to 202 of the justification.

(The pages of the justification follow:)

WEAPONS PROGRAM—CONSTRUCTION OBLIGATIONS

Program statement

Estimated obligations, fiscal year 1957	$75, 814, 000
Estimated obligations, fiscal year 1956	60, 563, 186
Actual obligations, fiscal year 1955	30, 104, 014

The amount budgeted for weapons construction for fiscal year 1957 will provide (1) additional laboratory and technical facilities required in support of the weapons research, development, production, and storage activities; (2) replacement and additions to permanent base facilities at the weapons proving grounds; and (3) general plant projects required in support of the weapons program.

JUSTIFICATION OF PROJECTS FOR WHICH FUNDS ARE REQUESTED IN FISCAL YEAR 1957

1. Project No. 57–b–3—Weapons production and development plant, $15 million

This project provides for those additional developmental, production, and assembly facilities necessary for continued progress in the development of improved atomic weapons.

2. Project No. 57–b–2—Weapons assembly plants, $15 million

This project provides for the construction of weapons assembly and supporting facilities at various locations. Construction will start on July 1, 1956, and be completed in about 15 months.

3. Project No. 57–b–5—Storage site modifications, $2 million

This project provides for modifications of and additions to existing storage facilities at weapons storage sites.

4. Project No. 57–f–2—Base construction, Pacific Proving Ground, $1,569,000

The base construction required at the Pacific Proving Ground in fiscal year 1957 includes: (*a*) extension and improvement of fire protection facilities and the replacement and rehabilitation of warehouses on Eniwetok Island; (*b*) a landing ship utility (LSU), haulout facility and equipment repair shops on Parry Island; and (*c*) miscellaneous construction on both islands.

Fire protection, Eniwetok.—This subproject includes (*a*) installation of an 8-inch salt-water line loop around the petroleum, oil, and lubricants (POL) warehouse and shop areas and 6-inch extensions to the salt-water systems in the housing areas in addition to 2 fire pump stations; (*b*) a 48- by 54-foot prefabricated fire-resistant aluminum building to replace existing temporary housing for water distillation equipment; and (*c*) installation of a protective foam system for new POL additions.

Item (*a*) above is considered necessary to supplement a presently inadequate supply of salt water for fighting possible serious fires in the areas enumerated. Item (*b*) above is required to provide fire protection to equipment housed temporarily for Operation Castle but which, it has been determined, will be needed in subsequent operations also. Item (*c*) above is considered necessary to protect new POL additions to be erected in fiscal year 1956.

Warehouses, Eniwetok.—This subproject provides 14,400 square feet of new replacement warehouse space and rehabilitation of four existing warehouses to complete the replacement of badly deteriorated warehousing on Eniwetok Island.

Landing ship utility (LSU), haulout facility, Parry.—LSU, barge and tug type vessels are presently maintained in a floating Navy drydock which must be overhauled at a cost of $243,000 every 3 years. Construction of land-based maintenance facilities, for an estimated $189,000, nearer to marine maintenance shops and the source of supplies, will permit more efficient use of manpower and materials and will be amortized in less than 3 years.

Equipment repair shops, Parry.—This building, comprising 19,200 square feet would house in a central area the blacksmith, welding, battery, tire, and heavy-equipment repair-shop areas and replace a combination of sheds, canvas lean-to's and an old quonset, all in poor and deteriorated condition. The new permanent arrangement will permit maximum use and protection of expensive equipment and efficient manpower utilization, as well as afford close support and coordination with other maintenance shops.

Miscellaneous construction, both islands.—This subproject provides for minor new construction and plant modifications found to be necessary each fiscal year to assure effective operation of the proving ground. More than two-thirds of the estimate is for items which should be accomplished in fiscal year 1956 were funds available. (Examples: security fencing, fuel and salt-water lines, utility improvements, a small craft ramp, fresh water storage, etc.)

The work outlined above will begin in July 1956 and will be completed in the spring of 1957. Improved fire protection, maintenance, and storage are the objectives of this request and constitute requirements of a continuing nature, necessary to successful conduct of future tests.

5. Project No. 57-f-4—Installation of 115-kilovolt tie line, Los Alamos, N. Mex., $1 million

With replacement and construction of new weapons facilities at the Los Alamos Scientific Laboratory required to meet expanding technical requirements, greater demands will be made for electric power and steam than can be provided by present capacities.

The present total firm electric power capacity at Los Alamos is 19,000 kilowatts, all locally produced. In fiscal year 1955 the peak consumption was 16,600 kilowatts; by 1958, requirements in excess of the fiscal year 1955 level are estimated to be 12,400 kilowatts—or a total consumption of 29,000 kilowatts.

Projections of steam requirements into 1958 also demonstrate the inadequacy of the present generating capacities. Demand curves indicate an increase from a peak demand of 105,000 pounds per hour in 1954–55 to 233,000 pounds per hour in 1958. The present facilities for steam production are capable of increasing steam output in the quantities required only if relief from power-producing demands is permitted by availability of additional power capability.

Installation of a 115 kilovolt power tie line with the Public Service Company of New Mexico (from Santa Fe to Los Alamos) will meet projected power demands and permit flexible production of both power and steam to satisfy forseeable demand combinations.

6. Project No. 57-f-5—Base Construction, Nevada test site, $543,000

Included in the fiscal year 1957 base construction for the Nevada test site are the following:

(*a*) *Enlargement of the scientific field laboratory area, $134,000.*—This area consists of 28 quonsets (plus 2 community-type latrines) which are used by the participating scientific agencies during test operations as field laboratories and offices. Since the University of California Radiation Laboratory has been established as a major test participant, the demands for this space have been greatly increased. In Operation Teapot, an extremely overcrowded condition was created, seriously hampering the work of the personnel of both laboratories and forcing outside storage of much delicate and expensive equipment that was not immediately in use. It is proposed, therefore, to erect an additional 10 quonsets to alleviate these conditions and assure smoother functioning of laboratory personnel. An additional community-type latrine will also be built.

(*b*) *Security building, $109,000.*—The security function at the Nevada test site is, at present, essentially split. Temporary badges are issued at the main gate and final processing a half-mile farther away at the security office in the camp. The time of personnel in process lost by this practice in Operation Teapot exceeded $30,000 in wages, per diem payments, etc. At the same time, the security office occupies ideally located permanent office space at the Nevada test site which has been in extremely short supply, both in the camp and at the control point, as

a result of increasing participation by the laboratories in test operations. It is planned, therefore, to construct a new security building at the main gate comprising 6,880 square feet, to house the entire pass and badge functions and release the space presently occupied by the security office to test participants.

(c) *Minor new construction, $300,000.*—This item includes capitalized maintenance and permanent plant additions and modifications of minor scale found to be necessary each fiscal year to assure effective operation of the test site. (Examples: revisions to electrical distribution system, paving of the motor pool area and modification to the control point compound.)

Construction of the above items will begin in July 1956 and will be completed by December 1956.

7. Project No. 57–f–6—Manufacturing support plant, Kansas City, Mo., $444,000

Additional space in support of manufacturing operations is required to relieve crowded conditions at this location. Space now occupied by support functions will be released to production by transfer of these functions to the new facility. The project consists of a 100,000 square foot prefabricated metal building, with brick veneer front wall. It is scheduled to start in October of 1956 and to be completed in April 1957.

8. Project No. 57–f–7—Warehouse, Sandia, $308,000

This project is for the construction of a one-story warehouse, 100 x 400 feet, necessary to relieve overly stringent storage conditions at the Sandia Base. Currently, materials of great value (e. g., electronic testing equipment, etc.) are stored in temporary buildings of CCC vintage in poor condition or in open areas. The cost of renovation, and addition of necessary sprinklering systems to the temporary buildings would exceed by one-half to 8 times their present book value. The accelerated development program will also add to these warehousing requirements. The project would begin in October 1956 and would be completed by June 1, 1957.

9. Project No. 57–b–4—Weapons development and engineering facilities, Livermore, Calif., $10,000,000

This project is for the construction of development and production engineering buildings and other facilities required in support of the University of California Radiation Laboratory, Livermore, weapons research and development effort. The proposed construction consists of industrial type plant which will provide technical, warehousing, and administrative operating space for an employment level of approximately 1,000 people. Basic structures will be one-story, permanent, industrial-type buildings with part high bay for plant operations and overhead cranes. Construction will start in June 1956 and be completed in about 12 months. The above estimate excludes $800,000 for architect-engineer work initiated in fiscal year 1956.

10. Project No. 57–f–1—Metallurgy Laboratory, Livermore, Calif., $2,270,000

This project is to provide a facility for metallurgical research and development required in the weapons program at the University of California Radiation Laboratory, Livermore. The building will be a 1½-story structure, complete with special equipment with a gross area of approximately 30,000 square feet.

The project is scheduled to start in July 1956 and to be completed in approximately 12 months. The above estimate excludes $230,000 for architect-engineer work initiated in fiscal year 1956.

11. Project No. 57–f–3—High explosive and weaponizing plant, Livermore, Calif., $1,100,000

This project provides for additional facilities at site 300, a high explosive testing site in the Livermore vicinity, required by virtue of assignment of new programmatic responsibilities to the University of California Radiation Laboratory at Livermore. The project is scheduled to start in October 1956 and to be completed in January 1958. The estimate excludes $100,000 for architect-engineer work initiated in fiscal year 1956.

12. Project No. 57–f–8—Mechanical shop additions, Livermore, Calif., $300,000

An 8,000-square-foot addition to the mechanical shop building is proposed to provide additional shop space for fabrication of mechanical devices. The project is scheduled to begin in December of 1956 and to be completed in about 6 months.

13. Project No. 57–f–9—Programing building, Livermore, Calif., $180,000

The 704 Computer Building now under construction will be located about 40 feet from the building housing the 701 computer. This project proposes

construction of a 40 by 90 foot two-story building between the two computer buildings to provide centralized work areas for coders and programers.

There is at present no available work space in close enough proximity to the computers to prevent the loss of valuable time of coders and programers traveling between the computer buildings and other work areas. Since the computer rental will total $1.6 million a year, it is necessary to increase efficiency and provide all possible flexibility to the operation of these expensive machines.

Construction will be structural steel frame with masonry walls and reinforced tile covered concrete floor. The project is scheduled to start in July 1956 and to be completed in approximately 12 months.

14. Project No. 57–b–1—Area 5 expansion, $20,900,000

This project will provide for additional fabrication facilities required by the Weapons Program. Included will be construction of a new building and related expansion and modifications to existing fabrication buildings. The new building will have approximately 118,000 square feet of floor area and will consist of structural steel frame with walls and partitions of concrete block or structural red clay tile. Construction is scheduled to begin in July 1956 and to be completed by June 30, 1958.

15. Project No. 57–n—General plant projects, $5,200,000

This project is a consolidation of general plant projects required in the operation of production installations, research and development laboratories, and minor facilities of the weapons program. With sharply expanding programs in three weapons laboratories, emphasis in this project in fiscal year 1957 is placed upon research and development. New construction and alterations of a minor nature grow out of changes in program requirements and research developments. Physical change in facilities generated by such requirements are revisions in production and research lines or processes and new minor research or production facilities required in the weapons program. Also included in this project is provision for minor modifications to roads, utilities, and other miscellaneous work which are required in a changing program and in order to maintain facilities at necessary levels of operating efficiency.

In fiscal year 1956, $4,950,000 is programed for this work. Requirements totaling more than half of the fiscal year 1957 estimate are known and, were funds available, would be done in fiscal year 1956. In lieu of fund availability, these items have been programed in this project for fiscal year 1957.

GENERAL STATEMENT

Mr. CANNON. Give us a brief word on that, General.

Mr. FIELDS. Our estimated requirement for the weapons program is $75,814,000 for fiscal year 1957. This is to cover the 15 projects listed. They include additional laboratory and technical facilities required for the support of the weapons research, development, production, and storage activities, and for the replacement of, and certain additions to, permanent facilities at our weapons providing grounds. There are 2 of these, 1 in the Pacific and 1 in Nevada.

The last item is for general plant projects required to support the weapons program. These projects encompass the requirements for this program as we see them for fiscal year 1957.

WEAPONS PRODUCTION AND DEVELOPMENT PLANT

Mr. CANNON. Please take up, for example, project No. 57–b–3, and point out to the committee what individuals would pass on an estimate for one of these facilities under this heading?

Mr. FIELDS. The Director of the Division of Military Application would pass on that facility and any other project under this heading unless it exceeded $10 million in cost, in which case I would, sir.

Mr. CANNON. You pass on all in excess of $10 million?

Mr. FIELDS. Yes, sir.

STORAGE SITE MODIFICATIONS

Mr. CANNON. Relative to the storage site modifications, project 57–b–5, you speak there of construction revisions required for a more comprehensive functional surveillance to determine operational quality. Will you expand a little bit on that Quality Assurance program?

Mr. FIELDS. Perhaps I should ask General Starbird to answer that question, sir. He is the Director of the Division of Military Application.

Mr. CANNON. General Starbird.

(Discussion off the record.)

BASE CONSTRUCTION AT PACIFIC PROVING GROUNDS

FUNDS FOR MISCELLANEOUS CONSTRUCTION

Mr. CANNON. General Fields, last year you asked us for $1,568,000 for base construction at the Pacific Proving Ground. That is exactly $1,000 less than you are asking this time. Now, on page 197, in referring to miscellaneous construction, you say:

> More than two thirds of the estimate is for items which should be accomplished in fiscal year 1956 were funds available.

Now, I thought, as Mr. Rabaut stated awhile ago, that you had no paucity of funds for all purposes. Why do you say here that there are conditions under which funds will not be found available? This committee has been more than generous in supplying money.

Mr. FIELDS. Could you answer that, General Starbird?

General STARBIRD. There was no intent to indicate that the committee had not provided for fiscal year 1956 the funds that then appeared to be required. What we are saying, sir, is that since that appropriation was made, additional requirements have been revealed, and actually if we had the money available now, we would cover those requirements at present, rather than waiting until fiscal year 1957.

Mr. CANNON. Is lack of funds for that purpose at this time due to the fact that the money was not recommended by the Budget or due to the fact that Congress cut down the budget recommendations?

Mr. McCARTHY. May I answer that?

Mr. CANNON. Yes. Mr. McCarthy.

Mr. McCARTHY. The limitation pertains solely to the amount authorized for this project at the time the authorization was provided a year ago. This was based on the amount that we estimated would be needed. So the statement does not pertain necessarily to the funds available but rather to the amount of the authorization which we had requested.

Mr. CANNON. It is a deficiency of authorization rather than a deficiency of appropriation.

Mr. McCARTHY. That is right.

Mr. CANNON. This committee and the House then have made every provision which you considered essential at the time the bill was passed?

Mr. FIELDS. Mr. Chairman, there was one item last year which I believe was cut out somewhere along the line. It was a small item for

the construction of a school at the Argonne National Laboratory. I believe we did request this but appropriations were not forthcoming for it.

Mr. CANNON. As a result of that failure was there any retarding of developments at that laboratory, or in the production of that class of material?

Mr. FIELDS. No, sir.

Mr. CANNON. In view of the similarity between this year and last year's request, would it be safe to assume that annually your request will approximate this amount for this item, the base construction of the Pacific Proving Ground?

General STARBIRD. Well, we will screen every year, sir, to keep it to the minimum amount required. I do not think we can say, until this test is over and plan for the next test, what the requirement will be in the future years.

Mr. CANNON. What is your estimate of the capital value of all the facilities at the Pacific Proving Ground?

General STARBIRD. It is an extremely extensive one. I will supply the capital value for the record.

Mr. CANNON. What would you say it aggregates?

Mr. FIELDS. The Controller may have that figure, sir.

Mr. BURROWS. Could I furnish that in a few minutes, sir?

Mr. CANNON. You may supply that for the record.

NOTE.—The investment in facilities at the Pacific Proving Grounds, as of June 30, 1955, was $24 million.

BASE CONSTRUCTION AT NEVADA TEST SITE

CONSTRUCTION OF DORMITORIES

Last year you estimated that you would have hutment structures at the Nevada test site replaced by dormitories by June 1956. At that time you represented these hutment structures as highly undesirable, and you emphasized the necessity of replacing them with dormitories. Has that been accomplished?

General STARBIRD. Construction of the dormitories is now under way there, sir. The present request is basically for space for the replacement of hutments that are used for the scientific laboratory space, rather than for actual housing.

Mr. CANNON. They are not needed at this time for dormitories?

General STARBIRD. The specific request which appears in this budget is not.

Mr. CANNON. I do not remember whether you promised or whether we made the appropriation with the understanding that these would be available by June 1956. We are very close to that date.

Do you think you will have kept the schedule agreed on last year?

General STARBIRD. I cannot answer that, sir. There again I will supply it for the record. I do not think that the construction will be complete by June 30, but they will be completed by the time they are needed.

Mr. CANNON. Would there by any additional cost in accelerating this construction? Will there by anything saved by taking it leisurely?

General STARBIRD. At the present time we are at minimum strength there, and the buildup will not come until later.

Mr. CANNON. Mr. Rabaut.

Mr. RABAUT. Last year, wasn't the suggestion made that we were going to put dormitories in place of these other structures?

General STARBIRD. That is an effort now underway, sir.

Mr. RABAUT. The only replacement you are making now is for the scientific personnel?

General STARBIRD. The amount requested in the 1957 budget is for scientific facilities.

Mr. RABAUT. How far have you progressed with relation to last year?

General STARBIRD. I will have to supply that for the record.

(The information follows:)

The fiscal year 1956 submission contained a request for 16 dormitories to house personnel at the Nevada test site. The construction of these dormitories will be completed in September 1956, and the hutments replaced by these dormitories will be removed. However, some hutments will continue to be required due to the increase in the number of scientific and support personnel required during tests. The completion of the 16 dormitories in September will provide billeting space for 1,500 people with the possibility of accommodating an additional 500 for short periods of time by double-bunking. However, during the Teapot tests, billeting exceeded 1,950 spaces for a period of more than 2 months, at one point reaching a peak of 2,752.

SECURITY BUILDING

Mr. CANNON. Now, at 6–B under 198, you request $109,000, but the building you propose to construct is a comparatively small one, only 6,880 square feet. Why is $109,000 necessary for that character of building?

General STARBIRD. The building concerned will be a fire-resistant building, sir. It will be a building with equipment for the accomodation of personnel, will be broken into offices. This is not only a structure. The basic costs involved for the building are about $11 per square foot. The remainder of the costs involved are for the utilities and for engineering and design. This estimate is based generally on the cost of comparable buildings within the area concerned, sir. This is a location, of course, that is quite removed from an ordinary city. In fact, it is about 60 miles from Las Vegas.

Mr. CANNON. Is this for special needs?

General STARBIRD. It is, sir.

Mr. CANNON. For example, you say it is fire-resistant. That involves additional expense?

General STARBIRD. It is a metal building, sir.

WAREHOUSE AT SANDIA

Mr. CANNON. Concerning this warehouse at Sandia, I believe that is project No. 57–f–7. When you appeared before the Joint Committee on Atomic Energy, you explained the high cost by pointing out that the office space must be included. What part of the 40,000 square feet is going into office space?

General STARBIRD. I cannot give you the square footage. I will provide that also.

Mr. CANNON. The office space there must occupy quite a large part of the building.

NOTE.—The office space will be 2,000 square feet.

General STARBIRD. Actually the air conditioning and the heating, sir, is intended for the entire building, not only the office space concerned, but the whole building itself will be air conditioned and will be heated.

WEAPONS DEVELOPMENT AND ENGINEERING FACILITIES, LIVERMORE, CALIF.

Mr. CANNON. And at Livermore, Calif., you tell us the construction will provide space for approximately a thousand people. Is that in addition to the 1,800 University of California Radiation Laboratory staff that you have there at the present time?

General STARBIRD. It is, sir.

Mr. CANNON. How rapidly are you increasing your staff there? By the time your construction is completed, what will be the total employment there?

General STARBIRD. We expect by the time all of this construction is completed, sir, that the employment will have risen above the approximately 2,000 now employed by at least another thousand. As General Fields explained that laboratory's function is being changed.

Mr. CANNON. In what respect?

(Discussion off the record.)

PROGRAMING BUILDING, LIVERMORE, CALIF.

Mr. CANNON. In project 57–f–9 you ask for a small 2-story building, but you indicate that the cost will be $50 per square foot.

General STARBIRD. I don't think that is correct——

Mr. CANNON. That is not cubic foot, is it?

General STARBIRD. No, sir; I cannot check those figures on the basis of the square footage.

Mr. CANNON. Take the building you expect to erect, it looks as if on a very simple computation it will run $50 a square foot.

General STARBIRD. The actual gross square feet in it, sir, and I believe it is a floor and a half, the gross square feet is 6,100. The cost of the building itself is $110,000, or a cost of about $18.03 per square foot, exclusive of the engineering and utilities charges that bring it up to $180,000. Now, this is a very special building, Here again it is a building where the individuals work with the electronic computors. It is just what the name conveys, a programing building. It is one also that must be air conditioned, sealed, in view of the fact that it is a building connecting two computer buildings. There is a computor in each of the two buildings concerned.

Mr. CANNON. Then it is not an ordinary office.

General STARBIRD. It is not an ordinary building, sir.

Mr. CANNON. And the additional cost is due to additional installation. What do you estimate the total capital value of Livermore will be at the end of the fiscal year 1957, adding this year's appropriation to what you have there at this time?

General STARBIRD. Here again I will have to provide that figure.

Mr. CANNON. We would like to have actual cost.

NOTE.—The estimated capital investment at Livermore as of June 30, 1957, will be $32 million.

Reactor Development Program—Construction Obligations

JUSTIFICATION OF THE ESTIMATES

We will turn now to construction obligations for the reactor development program, and we will insert in the record here pages 209 through 215 of the justifications.

(The pages of the justification follow:)

Reactor Development Program—Construction Obligations

Program statement

Estimated obligations, fiscal year 1957	$140, 953, 000
Estimated obligations, fiscal year 1956	131, 653, 924
Actual obligations, fiscal year 1955	42, 385, 393

JUSTIFICATION OF PROJECTS FOR WHICH FUNDS ARE REQUESTED IN FISCAL YEAR 1957

The reactor development construction program for fiscal year 1957 includes developmental and protype reactors and test area facilities under the military reactor program, which are estimated to cost $110,625,000, consisting of $29,225,000 for reactors and $81,400,000 for test area facilities. There is $27,428,000 estimated for support and technical facilities required for both the civilian power and military reactor programs. The balance of $2,900,000 is for general plant improvements.

1. Project 57–c–8—Argonne Low Power Reactor Facility, $1,225,000

This project covers engineering, construction, and preoperational testing of a fixed, prototype nuclear powerplant being developed by the AEC to satisfy military requirements stated by the DOD. It provides for a complete power-generating system adequate to satisfactorily test, under variable load conditions, the performance of the system and to evaluate its characteristics. A conceptual design of this plant has been prepared by Argonne National Laboratory. Development and final design have been initiated. The proposed system is planned to include a boiling water, metallic fuel element reactor of about 2 megawatt heat capacity, turbogenerator, condenser, shield, cooling tower, instrumentation, electrical and space heat load simulators, required building and test facilities and accessory equipment. The plant output will consist of about 200 kilowatts of electricity and several hundred Kelvins of space heat. Emphasis will be placed upon achieving a low-cost plant requiring a minimum of attention for operation and maintenance.

2. 57–g–2—Chemistry cave for radioactive materials, Argonne National Laboratory, $800,000

This facility will provide 2 cells, with shielding, for 10,000 curies of 1 MEV gamma and 1 cell for 10 curies. The total working space of the high level cells is 7 by 17 feet and the lower level cell is 7 by 9 feet. The cave will be used in the separations process research programs, particularly in those programs concerning irradiated massive plutonium. It will also be used as an analytical facility where specimens of highly radioactive materials can be sampled or diluted and analyzed.

This project replaces project 56–g–3 authorized by Public Law 141, which was under estimated due to lack of design detail.

3. Project 57–g–3—Transient housing, Argonne National Laboratory, $533,000

One of the important functions of the Argonne National Laboratory is to serve the participating universities and colleges in the Midwest as a focal point for the teaching and dissemination of information on atomic energy. This program is implemented by faculty members, graduate students and undergraduates working from 3 months to 1 year at the laboratory. Program effectiveness has been seriously handicapped by the inadequacy of housing accommodations on the laboratory premises and in nearby communities. Present facilities at the laboratory include a guest house with 5 bedrooms and 2 cottages, which are usually filled by overnight laboratory visitors. This project provides (1) 60 single rooms—10 with private baths and 50 with connecting baths; (2) 18 double rooms—each with individual bath arranged to rent individually or combine as many as 3 rooms into a suite incorporating either 1 or 2 bedrooms with a living room; (3) a

lounge and reception desk area; (4) an apartment-type laundry facility; and (5) parking area, access roads, sidewalks, etc.

4. Project 57–m–1—Purchase of Bettis Field property, $400,000

The property proposed to be purchased consists of approximately 195 acres located in Allegheny County, Pa., about 11 miles southeast of Pittsburgh. It includes 2 brick hangar buildings, now converted into shop areas, totaling 34,000 square feet, a prefabricated steel hangar containing 7,200 square feet of floorspace, and 2 small brick administrative buildings containing a total of approximately 9,000 square feet of floorspace.

Exercising the option to purchase the property under the terms of the lease would save the Commission over the next 10 years an amount equivalent to the purchase price in annual payments to Westinghouse Electric Corp. for rent, taxes, and insurance.

At this location, in facilities owned by the Government and leased from the Westinghouse Electric Corp., there is being conducted a program of reactor development and reactor-core fabrication. Considering the present Government investment in plant, and the expected continued need for the facilities, it would appear desirable to acquire title to the land and non-Government-owned buildings.

5. Project 57–c–1—Aircraft nuclear propulsion ground test plant, area No. 2, Idaho, $36,500,000

This project will provide site development, administrative and service buildings, and experimental test facilities. The total estimated cost of this project is $55 million. The balance of the funds will be requested in a future budget.

6. Project 57–c–3—Modifications and expansion of aircraft nuclear propulsion ground test facilities, area No. 1, Idaho, $10 million

This project will provide increased development test capability required by the ANP program. The project includes additions to existing facilities as well as new test buildings. Total estimated cost of the project is $15 million. The balance of the funds will be requested in a future budget.

7. Project 57–c–5—Expended core handling and service plant, National Reactor Testing Station, $4,750,000

This project is to provide a plant to receive, store, and examine expended reactor cores, of the water-cooled reactor types, and prepare the fuel for shipment to reprocessing plants. The developmental nature of reactor cores requires that these cores receive thorough inspection after they have been expended. It is also desirable to remove, as much as practical, structural portions of the core from the fuel assemblies before shipment to a chemical processing plant. This plant will provide the necessary space and equipment for performing numerous machine operations on the core and the examination in detail of specific fuel elements. The plant will contain shielded cells and water pits.

8. Project 57–c–9—Materials testing reactor hot-cell extension, National Reactor Testing Station, $310,000

An extension to the existing hot cell is required to provide additional space for examination of the increasing variety of samples irradiated in the materials testing reactor. The extension planned will provide a second cell, additional storage space for contaminated equipment, a mockup room, and an area for storing radioactive samples. The second cell will be designed for handling materials of a lower radiation intensity, which will release the existing high level cell for work on materials requiring greater shielding effectiveness. This modification will result in a more efficient facility which will not only increase the capacity of the facility, but will also expedite the testing of lower level radioactive materials.

9. Project 57–g–1—Addition to electrical power system, National Reactor Testing Station, $3,800,000

This project will provide electric-power facilities for an additional 40,000 kilowatts capacity to meet additional NRTS demands anticipated for fiscal years 1958 and 1959. Total capacity of the current transmission line to the NRTS from the Goshen source is limited to 40,000 kilowatts. The new 40,000-kilowatt transmission line will bring in a second source, American Falls. Related additions and modifications to the NRTS electrical facilities are also included in the project to distribute the power and insure reliable continuous service to the ANP and other NRTS areas. These consist of a new transmission line from NRTS central facilities to the special power excursion reactor test-organic moderator reactor

experiment area and an extension of the NRTS transmission line from the SPERT-OMRE area to the ANP site.

The total estimated power requirement through fiscal year 1960 is 120,000 kilowatts, which will call for another 40,000-kilowatt transmission line to the American Falls source and related NRTS electrical facilities. This second increment to raise NRTS capacity from 80,000 to 120,000 kilowatts will be requested in a future budget.

10. Project 57-g-4—Materials testing reactor maintenance shop, National Reactor Testing Station, $235,000

In conjunction with the expanding materials testing reactor experimental program, it has been necessary to increase the size of the maintenance force beyond the capacity of existing facilities, which are located in four different buildings wherever space could be made available, the major portion being outside the exclusion area. In order to achieve as efficient operation, it is imperative that all maintenance forces be consolidated in a central location near the work site. The proposed maintenance shop addition consists of a 2-story structure (91 feet by 92 feet by 26 feet), with reinforced concrete foundation on spread footings, 12-inch thick pumice-block walls, reinforced-concrete roof deck with rigid-type insulation and built-up roofing.

11. Project 57-c-2—Research and developmental test plant, $25 million

This project provides for necessary construction and modification of laboratory facilities at existing laboratory sites and for design and construction of limited testing facilities required in fiscal year 1957.

12. Project 57-c-4—Small submarine reactor test facility, $10 million

This project consists of a land prototype reactor powerplant, and the related facilities required to prove design assumptions and operating characteristics that would assure operational success of installation in a small submarine. Combustion Engineering, the development contractor, will provide all required facilities except the reactor and its associated components.

13. Project 57-c-6—Food irradiation facility, $3 million

The Commission has received from the Department of Defense a requirement for the development of a reactor for use by the Army Quartermaster Corps. The reactor is to be used as a radiation source in connection with their current program of investigating the preservation of foods by radiation sterilization. The reactor will be constructed by AEC as part of the food irradiation center program of the Department of Defense. Several reactor types appear capable of supplying adequate levels of radiation. Conceptual designs will determine the most promising types.

14. Project 57-c-7—Project Sherwood plant, $2 million

It is anticipated that additional facilities will be required in fiscal year 1957 for this program in order to assure uninterrupted progress in the research and development effort.

15. Project 57-c-10—Power reactor development acceleration project, $15 million

The major achievements of the civilian power reactor development program, of which this project is a part, are the demonstration of the technical feasibility of nuclear power and the significant advancement toward economic feasibility. This program is also conceived as and continues to be a minimum Government-supported program encouraging industrial participation and thus providing the basis for transition to a privately financed nuclear power industry.

It has now become apparent to the Commission that with the investment of additional funds it will be possible to accelerate work on several of the most promising reactor concepts for economic nuclear power and thereby advance the date when this technology can be made available to, and exploited by private industry for the installation of nuclear power capacity with its own funds. In addition, requirements exist for associated capabilities such as fuel processing, fuel separation, and reactor safety particularly in connection with problems evolving in the fast reactor concepts.

The Commission also recognizes that it may receive proposals from industry to participate in a power reactor construction project. If the Commission determines that such a proposal would substantially advance reactor technology and would contemplate that the major portion of the work be performed by the industrial proposer, the Commission would expect on a priority basis to utilize the fund availability being requested to participate in such a proposal.

16. Project 57–n—General plant projects, $2,900,000

This project is for minor alterations, improvements, additions or new construction for facilities under the Chicago, Idaho, and Schenectady operations offices. This estimate is based on experience in prior years, age, and condition of the facilities, other work planned for the facility and any special needs which are apparent. The estimate is for the following requirements for each operations office:

Chicago	$1,700,000
Idaho	800,000
Schenectady	400,000
Total	2,900,000

16. Project 56–b–3—Surface ship reactor facility, $15 million

This project provides for construction of a land prototype of a nuclear powerplant suitable for use by a large naval surface vessel, and for related facilities for testing the prototype. The total estimated cost of the project is $25 million, of which $10 million was provided in fiscal year 1956. Construction of the facility was authorized by Public Law 141, 84th Congress.

17. Project 56–b–6—Aircraft nuclear propulsion program plant and test area, Arco, Idaho, $9,500,000

This project provides for the construction, at the NRTS, Idaho, of facilities for the ground testing of a prototype aircraft nuclear propulsion system, and is a part of the ANP area No. 1 test facilities. Total estimated cost of the project is $13 million, of which $500,000 was available in fiscal year 1956 for design criteria and definitive design specifications. The balance ($3 million), required after 1957, will be requested in a future budget. This project was authorized by Public Law 141, 84th Congress.

GENERAL STATEMENT

Mr. CANNON. Give us a brief summary.

Mr. FIELDS. We are estimating our construction requirement for the reactor development program to be $140,953,000. This is to cover 18 projects listed in the justifications which follow. They include prototype reactors and test-area facilities for the military reactor program estimated to cost $110,625,000. This consists of $29,225,000 for reactors and $81,700,000 for test-area facilities for the military reactor program. The remaining amount under this construction estimate includes $27,428,000 for supporting technical facilities required for both civilian power and military reactor programs and $2.9 million for general plant improvements.

Now the projects include an Argonne low-power reactor facility in the amount of $1,225,000; a chemistry cave for radioactive materials at the Argonne National Laboratory in the amount of $800,000; and transient housing facilities at Argonne National Laboratory in the amount of $533,000.

CHEMISTRY CAVE FOR RADIOACTIVE MATERIALS AT ARGONNE NATIONAL LABORATORIES

Mr. CANNON. Now, concerning that chemistry cave at the Argonne, you told us originally that you expected to build that for $448,000. You tell us now that it will require $800,000.

Mr. FIELDS. That is correct, sir.

Mr. CANNON. Last year's justification indicates that the new cave you are preparing will be slightly reduced in size in comparison with the other one. Tell us now if you had been authorized to proceed with your original design, that is the larger cave——

Mr. FIELDS. We did proceed with the design, sir, and when we developed an estimate on the basis of that design we found that we could not build it within the amount we had asked for.

Mr. CANNON. You could not have built it at the original estimate?

Mr. FIELDS. That is correct, sir. We did not build it. We requested increased authorization, and following that have requested this appropriation for it.

Mr. CANNON. If you had used the original amount, and had reduced the size of the cave, would that have given you satisfactory facilities?

Mr. FIELDS. It would not have given us satisfactory service. We could have built something, but it would not have answered the purpose.

Mr. CANNON. To what do you attribute that big difference? There is quite a difference. You missed it by nearly half.

Mr. FIELDS. This is a very special purpose facility.

Mr. CANNON. Wasn't that understood at the time you submitted the design?

Mr. FIELDS. It was understood when this was first laid down as a request. I don't believe we fully understood the cost of the special requirements.

Mr. CANNON. Did you make any readjustment in your plans?

Mr. FIELDS. In the criteria for it? I am informed that there was an additional requirement which came along after the building was first designed. This was for hoists of a capacity which resulted in a requirement for heavier construction in the facility. The requirements did change after the original request in that respect.

Mr. CANNON. If there had been no change in the plans and specifications, you probably could have constructed it for the amount originally requested?

Mr. FIELDS. I presume so. I do not know, sir. I would have to check this and supply it for the record.

(The information follows:)

Project No. 57-g-2—Chemistry cave for radioactive materials, Argonne National Laboratory

July 1954 estimated cost	$448,000
Current estimated cost	800,000

The change in estimated cost reflects the preliminary nature of design information available at the time the 1954 estimate was prepared rather than any substantial change in the scope of the project.

The principal design changes relate to manipulators, certain electronic equipment, and the addition of a 2,000-pound hoist with related structural changes. Bids for construction ranged from $365,000 to $618,000 against an original estimate of $260,000. The increased construction cost over the original estimate plus a related increase in the amount included for contingencies account for the larger part of the difference between the two estimates.

Mr. CANNON. This is undoubtedly due, in part at least, to revised estimates?

Mr. FIELDS. Yes, sir.

TRANSIENT HOUSING AT AROGONNE NATIONAL LABORATORY

Mr. CANNON. Then what are your plans for operation of transient housing at Argonne?

Mr. FIELDS. This will be operated as a facility for transient housing for scientists.

Mr. CANNON. We have the idea that this guest housing will be operated at a loss. It has been and is being operated at a loss at this time?

Mr. FIELDS. I do not know the answer to that, sir. Do you happen to know, Mr. Burrows, whether it is being operated at a loss?

Mr. BURROWS. I do not know.

Mr. FIELDS. I will have to provide that information for the record.

Mr. CANNON. If it is being operated at a loss, and that is the information we have, does that mean we will have to reduce the requirements or that we will have to increase guest charges? Would it be advisable for us to increase charges to take up the loss and put it back in black ink?

Mr. FIELDS. We do have a requirement for housing because of the location of the laboratory. At the Argonne National Laboratory we attempt to get as much cooperation and participation by the scientists of the universities in the Middle West as is possible. This is both for the good of the laboratory and the good of our program. They come to the laboratory and work there for periods of 2 months, 3 months, or even a half year.

Mr. CANNON. Why could you not increase charges to the point where it could be made self-sustaining? That would not be an imposition on those who require accommodations there.

Mr. FIELDS. It should not be. I will have to look into this question for you, sir, and perhaps I could report on it tomorrow.

(The information follows:)

The Guest House at Argonne is operated by the University of Chicago under the AEC contract covering the operation of the Argonne National Laboratory. There are 12 beds in the Guest House, plus 6 beds in each of 2 adjacent cottages.

Occupancy rates are about 80 percent for the beds in the Guest House and 90 percent for the beds in the cottages. Rates are $3.50 per person except for 2 single rooms which rent for $6 each.

Expenses and revenues: Fiscal year 1956 through May 31, 1956

Salaries and wages	$8,675
Material and supplies	252
Laundry, utilities and miscellaneous	276
Shopwork	200
Total	9,403
Revenue	8,673
Net loss	729

It is expected that by the end of the fiscal year the net loss will have been reduced substantially. The net loss in fiscal year 1955 was approximately $1,000. Rates are established, and costs budgeted, on a break-even basis.

The transient housing proposed will be operated on the same basis by the University of Chicago. Rates will be established at a level that will cover expenses at an 80 percent occupancy rate.

Mr. CANNON. The committee will stand adjourned until 10:30 o'clock tomorrow morning.

TUESDAY, JUNE 19, 1956.

Mr. CANNON. The committee will come to order.

PURCHASE OF BETTIS FIELD

We will resume our discussion of the Atomic Energy Commission budget. We next have the Bettis Field property which you propose to purchase, General Fields. It now has $20 million in Government facilities on it. Under what type of contractual arrangement were these facilities put there, and could they be regarded as fixtures? That is, if our lease expired, would they go with the property or would we be in a position to reclaim them?

Mr. FIELDS. Could you answer that, Mr. Burrows? Under the contract, we have an option to buy.

Mr. CANNON. If that option were not exercised and your lease expired, and you relinquish the property, are the fixtures there of such a character that they would go with the real estate?

Mr. BURROWS. You have the same problem under those circumstances that you would have in any building that is constructed on leased land. Some of the equipment could be easily taken out. With other equipment, it might cost more to strip it out than it would be worth.

Mr. CANNON. In any event, it would involve a loss to the Government of money which had been expended for purposes of improvement and special use.

Mr. BURROWS. There would certainly be a considerable loss; yes, sir.

Mr. CANNON. Do you think that $20 million is a fair estimate of the value of the Government facilities?

Mr. FIELDS. Yes. $20 million is the estimated value of the Government-owned facilities. Our estimate of the purchase price is $400,000 for the land and the buildings now owned by Westinghouse.

Mr. CANNON. Do you think that is a fair price?

Mr. FIELDS. Yes, sir; although we will attempt by negotiation to get something less if we can. If we have to exercise the option under the contract, it will come to approximately that amount.

Mr. CANNON. We have little alternative, then, at this time.

Mr. FIELDS. In the interest of the Government, we believe it is better to purchase this property. In the course of 10 years, we would pay out more for rent than it would cost to purchase it. The Bettis plant is a center where the great bulk of our work on naval reactors is performed. This is a continuing long-range program.

Mr. CANNON. Do you think it wise for the Commission to install large and expensive machinery and appurtenances on land to which it does not have title and which it expects ultimately to acquire? To that extent, does it put you at the mercy of the owner?

Mr. FIELDS. It does, unless you include in the contractual arrangements an option to purchase such as you have in this case. The option provides for our taking the land at its original value and buildings at cost less depreciation. If you are initiating a new plant with a long-range program, I think it is better that it be on Government land. This is our normal practice. You will find instances where there are

already facilities in being where it is advantageous to the Government to make modifications. In this way you will get the full use of the original plant and the additional facilities which the Government supplies. This happens on occasions.

Normally, for large industrial plants like Oak Ridge or Portsmouth, we do acquire the land initially.

ACCURACY OF ENGINEERING CONCLUSIONS AND ESTIMATES

Mr. CANNON. Have you found your engineering conclusions sufficiently accurate to warrant your expending large sums of money on their recommendations? For example, the Aircraft Nuclear Propulsion Ground Test Plant has been authorized to the extent of $55 million. You are authorized in this bill to transfer 25 percent, or you could deduct 25 percent. At the outside, you would have here $68,750,000. If that proved to be insufficient, if the engineering design was a little bit inaccurate, and the $68 million would not build it, what would be your position? What recourse would you have?

Mr. FIELDS. We would have to come back to Congress for more money.

Mr. CANNON. Is there any likelihood that in any of these programs you are establishing on the basis of engineering computation that that would be necessary? How dependable have you found the conclusions of your engineering staff?

Mr. FIELDS. I think we have found the conclusions generally to be sound. I believe in the fiscal year 1956 program, we did exceed slightly the estimate in the budget in the case of six projects. In about an equal number, we underran the estimates. So, the estimates have been generally sound.

These projects are extremely large and complicated. After we submit our budget there is a good deal of engineering still to be done before we let the contracts for the actual construction. Nevertheless, we do know that these projects require very extensive facilities. These facilities will be used to conduct full-scale reactor experiments, for test purposes. This means running reactors under conditions that are more strenuous than would actually be required under normal operations. Therefore, it requires very elaborate facilities in an isolated location. These are the best estimates we can make at this time as to the cost of the facilities required.

Mr. CANNON. It has been the unfortunate experience of this committee to find many engineering estimates inaccurate and inadequate. We notice it especially in the construction of large projects such as dams and flood-control projects. The estimated cost which we were led to believe would be ample to construct these facilities has missed the mark so far that the final cost of some of the project has been sometimes 2 or 3 times what it was originally estimated to be. I wondered what your experience has been along this line and what steps you were taking to avoid a situation of that kind.

Mr. FIELDS. We are doing as thorough studies as we can in advance of these projects in order to be sure that we cover the full scope of the requirements.

I believe our experience in the last few years has been very good in this respect. It is true, however, that in the case of the first Savan-

nah River expansion, it was underestimated considerably. We did have to come back to Congress again for additional funds for that particular project.

Mr. CANNON. We would like to have information on the airstrip being constructed in Idaho.

Mr. FIELDS. The airstrip is being funded by the Air Force. We do not have any money in here for the construction of the airstrip itself.

Mr. CANNON. Out of their appropriation? Or does it come out of your appropriation?

Mr. FIELDS. No, sir; it would not come out of our appropriations. We will do the construction for them under a transfer of funds, since we operate the facility at Idaho.

RESEARCH AND DEVELOPMENT TEST PLANT

Mr. CANNON. On your research and development test plant to which we have recently referred, you are amending your request and asking an increase for this purpose up to $25 million. The increases come as a result of a recent communication from the Department of Defense revising its requirements. Do you feel you have had sufficient time to estimate the amount of the increase needed?

By selecting the figure of $25 million, are you taking a figure out of the air which you think will be ample to cover any expenses which might be involved?

Mr. FIELDS. We believe this figure is related to our requirements. (Discussion off the record.)

This is for the initial work looking toward the determination of the feasibility of this kind of propulsion system.

Mr. CANNON. You are resorting here to that very expressive term that you used so effectively in the hearings yesterday, that word of somewhat questionable derivation "guesstimate."

Mr. FIELDS. I did not use that word. It was the chairman who used it. He used the expression "educated guess," which has the same connotation.

May I ask Mr. Davis, the Director of Reactor Development, to speak more specifically on this.

Mr. DAVIS. We have outlined in some detail what these actual facilities are but do not have firm cost estimates at this time. We feel that the estimate of $25 million is just about the amount needed to cover the work which will be started in 1957.

Mr. CANNON. Your first estimate was around $14 million. You have almost doubled it. For that reason, we wondered if you had any really accurate basis for running it from $14 million up to $25 million.

Mr. DAVIS. We have looked into it in more detail to see what is required. It is a rapidly developing project, and that is the reason the amount has gone up.

FOOD IRRADIATION FACILITY

Mr. CANNON. I should now like to revert to radiation, which, incidentally, seems to have attracted great interest in the newspapers in the past few days. It apparently involves some very alarming potentialities.

What has been the radiation source used by the Army?

Mr. DAVIS. They have been using, to a large extent, fuel elements from the materials testing reactor at Idaho, which have a large amount of radioactivity in them.

They have also been doing experiments with various accelerators.

Mr. CANNON. Is the Commission engaging in any such experiments or is this handled exclusively by the Army?

Mr. DAVIS. These have been handled by the Quartermaster Corps. We did start a program in this field several years ago. The Quartermaster Corps then became interested, so they took over the entire project.

Mr. CANNON. But you retained your interest in it sufficiently to form an opinion as to whether it is practical?

Mr. DAVIS. Yes, sir.

Mr. FIELDS. This particular project deals largely with irradiation of food. We do research at certain of our laboratories on the effects of radiation on plant life and even on food. To a certain extent this kind of research is done at Brookhaven. The reactor to be built is a service facility to make testing on a large scale possible.

Mr. CANNON. Can you say that sterilization for the preservation of food is a practical proposition and will be followed to any extent in the future?

Mr. FIELDS. Not for all foods but for certain specific ones.

Mr. CANNON. We are told in this morning's newspapers that radiation even from the face of a watch dial or the result of X-raying a foot or a hand may result in dire consequences. It is possible that utilization of radiation for sterilization of food would be dangerous to the operator?

Mr. FIELDS. The operator would have to take the necessary precautions, but the reactor could be operated without hazard in that respect. The food itself that is processed through these reactors will not become irradiated.

Mr. CANNON. Why isn't the Army justifying this appropriation just as you justified access road funds for the Public Roads Administration?

Mr. FIELDS. We have been working with Army on this project. They are not qualified at this time to design and construct a reactor. They felt it more appropriately fell to us. If this should expand into a large program requiring additional reactors, then it should be placed in their budget. This is in the nature of a development project for a reactor for the irradiation of food.

Our basic understanding with the Department of Defense is that we do the research on new types of reactors whether it be this type or propulsion reactors. Once the reactor is developed, then the Department of Defense would budget for the ones they need, such as additional reactors for submarines going into the fleet.

Mr. CANNON. Charges have been made that radiation will preserve the food, but will change palatability of the food. Have you found that to be true?

Mr. FIELDS. I understand that is true in certain instances, but there are still many cases where it is not true.

Mr. CANNON. Certain types of food or certain methods of processing?

Mr. FIELDS. It applies to certain types of food and also to the extent of radiation used on the particular type of food.

Mr. DAVIS. Sometimes a dose which would actually sterilize the food does produce substantial changes in the food. However a dose which does not sterilize but which will preserve it for a long period of time may not cause that change.

Mr. CANNON. It does not affect nutritive value?

Mr. FIELDS. You could give it so much radiation so that it would, but the problem is to find out how much irradiation you can give it for preservation without changing the taste or quality.

Mr. CANNON. They are being utilized commercially and industrially.

Mr. FIELDS. This reactor is really to carry the research through to the final development stage.

The progress to date indicates that irradiation should be a useful tool in the food industry. However, we really have to test it in volume before it can be used by the food industry on an extensive basis.

SHERWOOD PLANT

Mr. CANNON. Passing along to the Sherwood plant. As I understand it Sherwood is a code word.

Mr. FIELDS. Yes, sir.

Mr. CANNON. Would it be correct to say that this $2 million added to the amount indicated on page 88 for operating expenses represents the total directly budgeted for this particular activity? Is that the maximum amount?

Mr. FIELDS. At this time, yes, sir.

Mr. CANNON. That project is proceeding satisfactorily?

Mr. FIELDS. Yes, sir.

POWER REACTOR DEVELOPMENT ACCELERATION PROJECT

Mr. CANNON. Would it be fair to say that the power reactor development acceleration project, as outlined on page 214 of the justifications, is in the nature of a reserve fund for ideas that may develop in the next fiscal year rather than to carry out some specific plans which, at the present time, you have under consideration?

Mr. FIELDS. It has some aspect of reserve fund, although we have fairly clearly in mind some of the things that we would use this money for.

Mr. CANNON. You would not say it is a contingent proposition. Do you have definite programs under consideration which will require this?

Mr. FIELDS. Yes, sir. Is that not correct, Dr. Davis?

Mr. DAVIS. Yes, sir.

Mr. CANNON. We would be glad, General, if you would outline the work done in the past year or work that is in progress this year.

Mr. FIELDS. May I ask Dr. Davis to cover this?

Mr. DAVIS. We have considered using this money for two basic purposes. One of them is to supply funds for what we call the power reactor demonstration program. The other is to provide facilities needed for our own development program.

The $25 million made available in 1956 will be used for such projects as the consumers' public power demonstration program and the Elk River and Wolverine Cooperatives programs. These are the power demonstration projects which will consume part of the money.

In addition, we need additional engineering works areas at Brookhaven; and have the organic moderated reactor experiments to be carried out by North American Aviation which would be expansion of the Commission's development program.

We also have some additional projects under the power demonstration program still under consideration, which would require additional funds. Again, we have still under consideration a developmental power reactor facility which would take some of the money. Funds under this project are used on the power demonstration program and on our own power reactor development program.

GENERAL PLANT PROJECTS

Mr. CANNON. The committee is in a position where it is not able to accurately evaluate the necessity for this appropriation of $2,900,000 you are requesting for general plant projects. It seems to us that that is a rather substantial sum to provide for minor alterations and improvements.

What is the capital value of the facilities for which you expect to use this? They must be very large to require this amount for alteration

Mr. FIELDS. It is a large amount. Could we supply that for the record?

Mr. CANNON. You may supply that. That will be the capital value of the facilities on which you expect to spend this amount for minor alterations.

Mr. FIELDS. The project at Bettis Field would be included, for instance and the $90 million at the Argonne National Laboratory. There are hundreds of millions of dollars for plant investment involved in this item. However, we will supply it for the record.

(The information referred to follows:)

The capital value of the reactor development facilities is $303.6 million.

SURFACE SHIP REACTOR FACILITY

Mr. CANNON. Let us turn to project 56-b-3, the $15 million for surface ship reactor facilities, on page 215. When was construction started?

Mr. FIELDS. Dr. Davis?

Mr. DAVIS. I cannot recall the exact date, but it has been started within the last few months.

Mr. CANNON. Do you think that you could spend the total $25 million by July 1957? You would not require that much in that limited time; would you?

Mr. DAVIS. We would have it almost entirely committed. We would have it under contract by that time.

Mr. CANNON. You must have the money to meet these commitments as they become due, but you do not really expect to have to put up the entire $25 million by July 1957?

Mr. DAVIS. We would have to commit it if we are to start it by that time.

Mr. CANNON. Mr. Kirwan.

BETTIS FIELD LAND

Mr. KIRWAN. I see it costs $400,000 to purchase the property at Bettis Field.

Mr. FIELDS. We are requesting $400,000 to take up our option or the land.

USE OF EXCESS PLANTS

Mr. KIRWAN. I am going to ask a question which might be out of your line. Ever since the war, I have been sitting here on this committee. I wish you would tell me whether or not there is any building which has been constructed by the United States Government which could be used. We are spending billions of dollars a year on property. All over the country I see we have property up for sale.

Maybe I am missing the boat by a mile, but I have not been able to find where the Government has been able to use what it has. They usually have to build something else anew. Certainly the billions we spent on property should not have been spent in vain. We should be able to move into those buildings. Everybody except the Government seems to be able to use these buildings, but the Government has to have a new building.

Perhaps your time is too valuable, but I would like to have you appoint someone to see if there is someplace in the United States where the Government is able to occupy its own building.

Mr. FIELDS. We have, in certain instances, occupied existing buildings. We have a plant in Kansas City which occupies a building built during the war.

We are also utilizing a proving ground in Nevada which was a Government facility during the war. Similarly, we took over an old airfield at Livermore which was a Navy installation. We did have to do some construction work because we took only the field but there are some buildings that were utilized and are still being utilized.

Mr. KIRWAN. There are many buildings that the United States has today and buildings that could be used, but it seems the practice is to get rid of such buildings and build new buildings. I am not directing this at you.

Mr. Jensen and I went to an excursion inlet in Alaska. They built that at a cost of $33 million after the Japanese left Alaska. I asked the Governor of Alaska why he allowed them to build that excursion inlet. He said, "Allow them? I flew all the way to Philadelphia to ask them why they built it." I asked him, "Why don't you build it in Anchorage or Fairbanks?" He said that the general arose and said, "I can't."

They had 600 prisoners taking down the lumber. We followed that. They were shipping it to Seattle. They sold the lumber as second-class lumber. The Interior Department came along and bought it back from the people at Seattle and moved it all the way back to within 15 miles from where they had torn down the building to build Indian houses. All the Army had to do was take a piece of paper and say, "We are transferring so much lumber to the Interior Department," but they did not do that. There were 600 German prisoners tearing down those buildings. The lumber was shipped all the way to Seattle. We followed that lumber. It was sold first-class, and it was taken back for this Indian village. That is what I am talking about. Per-

haps you could run down half a dozen places where the Government could use some of its own buildings rather than selling them at a fraction of the cost or selling them at 10 cents on the dollar.

Just think of United States Steel buying the Provo plant at Utah which cost $200 million. They never produced a ton of steel during the war there. Immediately after the war was over, they sold it for 10 cents on the dollar. A peanut vendor could not operate that. It had to be some big corporation. They took the steel from the other plants. They made a hazard out of it or held up the war effort to build this huge plant that did not produce one ton of steel.

Mr. CANNON. Mr. Riley?

Mr. RILEY. General Fields, what is the target date on the development of this surface ship reactor?

Mr. FIELDS. May I ask Dr. Davis to answer that question for you.

(Discussion off the record.)

Mr. CANNON. Mr. Boland?

Mr. BOLAND. In line with what Mr. Kirwan said, does the Commission keep abreast of the facilities that are available by other agencies of the Government?

Mr. FIELDS. Yes, sir, we do. There are a great many of our facilities which were previously Government facilities. We quite often find that we can utilize the land and the utilities to a certain extent, for a limited period of time, we can use the existing facilities. But for the manufacturing processes and the laboratories it works out that the existing facilities are normally not adaptable. However, insofar as the land is concerned, we do look at this very carefully and we also look at the facilities.

Mr. BOLAND. Would the statement you just made have a bearing on this particular project?

I presume you have been into the question of research and development for a nuclear propulsion plant for some time. This is not something new, the research and development on a nuclear propulsion plant.

Mr. FIELDS. No, sir. These are special requirements. There is no such facility available.

Mr. BOLAND. You now require this type of facility to get to the end of the research?

Mr. FIELDS. Yes, sir. This is a very special facility with unusual shielding requirements. There just are not such facilities existing which could meet our requirements.

FOOD IRRADIATION

Mr. BOLAND. In relation to the radiation of food, I think you said that when the thing has developed to a greater extent, that it ought to be budgeted in the Army. I disagree. I think it should be budgeted in the AEC budget all of the time or else you are going to have every agency of the Government in here wanting to build reactors.

Mr. FIELDS. If they develop and have a very extensive program for constant irradiation of food for its preservation, then it becomes a process in their food chain, from purchasing food to putting it on the shelves and distributing it to the Armed Forces.

When and if they could go into the commercial market and have reactors fabricated then, at that instance, my feeling would be that

it should be budgeted by the Department of Defense. The purpose then would be to support their process for the preservation of food.

Mr. BOLAND. I agree on that basis.

Mr. FIELDS. So far as new development is concerned, I think we should do it.

Mr. BOLAND. I think you should continue in the development under these programs up until the time they do become of practical application where, actually, the agencies will be using them for their own specific use.

Mr. JAMES C. MURRAY. I have no questions.

CONSTRUCTION CRITERIA

Mr. JENSEN. We were talking about building costs a few minutes ago. I believe Mr. Johnson is in charge of your building program, are you not?

Mr. JOHNSON. No, sir.

Mr. JENSEN. Who is in charge of your building program?

Mr. FIELDS. Mr. Derry is in charge of our engineering and construction.

Mr. JENSEN. I have inspected many Government projects in the past years since I have been in Congress. Invariably, I have found special doors, special windows, special cases, special baseboards, special everything in an ordinary building where standard design metal work would be better and perhaps 2 or 3 times cheaper.

I would like to ask you this question: Do you in your specifications for ordinary buildings that are not built for any scientific purpose stay pretty well with standard designs, millwork, and the like, outside trim, inside trim, doors, and windows? Do you try to do that?

Mr. DERRY. Yes, sir; we do. We follow the Federal specifications wherever possible.

Mr. JENSEN. Are your Federal specifications special to all millwork?

Mr. DERRY. No, sir; they are the standard, usable, administrative, normal type of construction standards, and we utilize these in all of our standards. We have design criteria that cover these items and require nothing special.

Mr. JENSEN. That work is standard at the millwork houses?

Mr. DERRY. Yes, sir.

Mr. JENSEN. I am glad to hear that. It is horrible the way some Government agencies used to do that. They used to waste the taxpayers' money in specially designed doors and windows.

I shall never forget visiting one installation, a radar installation, in New Mexico. There were several buildings—perhaps a dozen good-sized buildings. The first thing that I noticed was a glass panel about a foot from the bottom of the door, all of the outside doors. They had taken a woden panel off and put in double-strength glass. I asked the building superintendent what the purpose of the glass was in the door. He said he wished someone would tell him. Without a doubt, that glass panel instead of the wood panel that was in the stock door would make that door cost twice as much. Some architect had designed that door because he wanted to design something different, and, of course, it was the taxpayers who suffered and paid the bill. I ran across such things all over.

I know of a building that was designed of a special trim of every nature. The first estimated cost was close to $2 million, and when they revised their plans and specifications and called for standard design millwork, the cost was reduced as much as $300,000. It is difficult for some to understand that.

I was in the lumber and contracting business for 24 years, to a small degree, and we soon learned that we had better stay with standard millwork design. It is not as good, perhaps, but it takes a lot more time to paint and putty around glass or put in glass molding; and it rots out a lot faster because the more frosting you have on a door, the quicker it will rot out.

You will see on Government buildings that were built up to 10 years ago, most every one of them had special trim of every description.

I am pleased to know that you do stick with standard stock.

Now, that is insignificant so far as the job you folks do is concerned, but I am rather schooled in that art of common, ordinary building costs, so I try to contribute my little part in keeping down costs wherever I can.

I was interested in your colloquy with the chairman, Mr. Fields, regarding your estimated costs of things and the actual costs. I believe you said that generally speaking your actual costs were just about what your estimated costs would be. We do have agencies of Government, I will admit, that like to get a project started and underestimate the cost of the project. Generally speaking, the finished project has cost more than the estimated cost, and I think that that is due to the fact that the unit costs have risen constantly. I find that, generally speaking, the estimated costs would have been pretty close to those actual costs of the agencies if the value of the components of the finished product had remained at the prices at which they were estimated.

I do not want to be too hard on the Government agency that says today that it is going to cost so much and then later, when it is finished, they say it is going to cost so much more. When you check into it, you find that everything that went into that building increased in cost. So, I do not feel that officials deliberately underestimate a project to get the money.

AIRCRAFT NUCLEAR PROPULSION PLANT AND TEST AREA, ARCO, IDAHO

Mr. CANNON. Reverting to the item on page 215 which we have just passed, project 17, the aircraft nuclear propulsion plant and test area at Idaho, as I understand it, we appropriated in the last bill half a million dollars for that. That is the money that is now being used in the current year. You are here asking for $9.5 million. I take it for granted in the next few years you will have a requisition for even more.

Mr. RABAUT. Has there been any development that you can tell us about that is taking place now that would be news to the committee?

(Discussion off the record.)

PHYSICAL RESEARCH PROGRAM, CONSTRUCTION OBLIGATIONS

JUSTIFICATION OF THE ESTIMATES

Mr. CANNON. Turning now to the construction obligations for the physical research program, we will insert at this point in the record, pages 220 through 229 of the justifications. Will you give us a statement of this program?

(The justification follows:)

PHYSICAL RESEARCH PROGRAM—CONSTRUCTION OBLIGATIONS

Program statement

Estimated obligations, fiscal year 1957	$13,832,000
Estimated obligations, fiscal year 1956	34,248,793
Actual obligations, fiscal year 1955	13,704,109

The fiscal year 1957 estimate provides for the construction of projects that are required by the physical research program for new research tools or modification of existing research tools to permit necessary progressive extensions in the fields of physics, chemistry, and metallurgy; new research buildings and facilities to permit maximum utilization of existing research tools; permanent research and engineering buildings to replace temporary buildings that have proven inadequate, inefficient, and costly to maintain; and general plant projects to permit minor capital improvements that are needed.

JUSTIFICATION OF PROJECTS FOR WHICH FUNDS ARE REQUESTED IN FISCAL YEAR 1957

1. Project 57-h-2—Physics building, Brookhaven National Laboratory, $880,000

This project provides for the construction of a permanent physics laboratory building that will be connected with the east wing of the existing cosmotron building. The building will be constructed in two phases. The first phase, for which funds are now requested, will permit a much needed consolidation of high energy physics activities while the second phase will provide departmental offices for the continuing physics staff; offices and laboratories for scientists engaged in research in nuclear structure, neutron physics and extra nuclear properties of matter; departmental services such as a machine shop, a stockroom, a library, and conference rooms; and office and computer areas for the applied mathematics division. The total cost of the building is estimated to be $2,140,000.

The quarters for the physics department at Brookhaven are the most inadequate in the entire laboratory; many staff members are widely dispersed in a number of temporary buildings that are in a serious state of deterioration. These buildings are costly to heat, costly to maintain, and constant repairs are necessary. In addition, they are inadequate for the activities they house and their wide disperson seriously hinders the overall efficiency of operations. The inadequacy of the individual structures has prevented or handicapped many experiments, while the wide dispersion of the physics staff has reduced cohesiveness and cross-fertilization. The net effect has been the maintenance of a research program under the most arduous and costly conditions. The proposed building will alleviate this situation and will centralize the activities of the physics department in a building close to the major facilities of interest to that department.

2. Project 57-h-3—Engineering building, Brookhaven National Laboratory, $1,879,000

This project provides for the construction of a permanent engineering building at the Brookhaven National Laboratory. The building will be an addition to the existing hot laboratory and will house those parts of the nuclear engineering department now located in a temporary wooden structure, as well as provide much needed additional laboratory space for radiochemical and chemical engineering studies. Building arrangements will be such that a portion of the building can be set aside as an exclusion area should the nature of the technical work require it.

The nuclear engineering department is presently located in three buildings. Two of these are of permanent construction but the third is a temporary, wooden structure with high maintenance costs and substandard laboratory facilities. It is this temporary building housing the reactor physics, chemical and mechanical engineering and departmental headquarters portions of the nuclear engineering department that needs replacement.

The building to be replaced is located at some distance from the rest of the department, hindering the coordination of related activities. Several programs (e. g., waste disposal, waste processing development, fission products utilization, reactor chemistry) are split between this temporary building and the hot laboratory for lack of proper facilities and adequate space. The proposed engineering building would provide for the creation at the most appropriate location of an adequately equipped nuclear engineering complex that would be able to meet all anticipated demands.

The estimate excludes $120,000 for architect-engineer work initiated in fiscal year 1956.

3. Project 57–h–5—Cosmotron target area, Brookhaven National Laboratory, $350,000

This project provides for an extension of the cosmotron experimental area and includes construction of a building 60 by 100 by 30 feet high with the same structural characteristics as the main floor of the cosmotron.

This structure is required primarily to provide some additional work space around the cosmotron. It is also needed if the proton beam is to be utilized to its best advantage. At the present time the experimental floor space around the cosmotron is limited and inadequate. Most of the area is under a low ceiling and the major portion has no built-in handling equipment. In addition, the most desirable space is occupied by the radiation shield and as a consequence some experiments have to be located in temporary housing and in trailers placed outside of the present structure. At present much time is wasted in moving the equipment into and out of position. This tends to increase the down time of the accelerator, since these moves can be made only when the accelerator is not running. The most efficient use of the cosmotron in contrast, could be achieved if the various experiments were left in place and the necessary high energy beams were brought to the experiments by electrical means.

The proposed addition would permit the experiments to remain in position for a greater length of time, alleviate the present overcrowding, serve to increase the variety of experiments that can be handled simultaneously, enable the laboratory to perform some experiments that are not currently feasible, and enhance the effectiveness with which the proton beam could be utilized. With reference to this last point, equipment is now being added to extract the proton beam from the vacuum chamber. Under present conditions, it is not possible to bring the beam out to the most desirable location (at a greater distance from the machine and its accompanying background radiation) unless additional space is acquired.

4. Project 57–h–6—Eighteen-inch cyclotron building, Brookhaven National Laboratory, $300,000

This project provides for construction of permanent housing for the 18-inch cyclotron now located in a temporary assembly area. The proposed building will be an extension to the west end of the present cyclotron, Van de Graaff Building. By integration of the 18-inch cyclotron with other low energy accelerators at this location, the most effective use of the machine can be made. The extension will be 82 feet long by 71 feet wide. One-half of the extension will be devoted to the cyclotron proper and to the experimental area (target room), and the balance to an assembly area and a room for control and counting equipment. The experience gained to date with the machine, and the continuing demand for the type of information that it will yield, make it necessary to house the machine in a permanent building. Its present temporary location, selected purely for assembly and test purposes, does not allow full use of the cyclotron since the radiation levels produced would be hazardous to operating personnel and other personnel in the same building or vicinity.

5. Project 57–d–3—48-inch heavy-particle cyclotron, Oak Ridge National Laboratory, $459,000

This project provides for a 48-inch heavy-particle cyclotron at the Oak Ridge National Laboratory that will be capable of accelerating multicharged carbon

and nitrogen ions in the energy range of 25 to 80 million electron volts. The project includes a suitably shielded room to house the machine. The proposed cyclotron is needed to cover an important energy range that will not be covered by those heavy particle accelerators now available or under construction.

In the past few years there has been a markedly increased scientific interest in heavy-particle accelerators and in the new areas of research that they make available. At the present time the ORNL 63-inch cyclotron is the only facility in operation in this country that was specifically designed for heavy particle acceleration. The 63-inch machine is performing effectively in the energy range for which it was designed (25 mev for nitrogen) but this range cannot be extended. The two heavy-particle accelerators under construction at Yale University and the University of California Radiation Laboratory are to operate at relatively high energies. Thus the range between their energies and the limit of the 63-inch cylotron will not be covered. The proposed 48-inch cyclotron would fill this void since it would be specifically designed to cover the energy gap between the limits of the 63-inch cyclotron and the coulomb barrier of the heaviest elements. It also would be a greatly improved design and as such would provide large currents of multicharged ions at well defined energies. These features will permit relatively precise measurements making possible a more thorough and more systematic study of several important fields of nuclear research.

The history of nuclear physics shows that important new phenomena are discovered with the advent of each new machine designed to cover an area that has not been under investigation. It is, therefore, likely that the proposed accelerator will also provide new and unexpected information that will result in a greater understanding of the nucleus.

More than 40 percent of the gross cost of the accelerator will be provided by transfers of components from the existing 44-inch cyclotron. The major new requirements will be a new 48-inch magnet and a shielded underground room to house the machine.

6. Project 57–h–1—Permanent research building, Oak Ridge National Laboratory, $5,780,000

This project provides for the construction of adequate and permanent buildings to house the personnel and operations at the X–10 area of the Oak Ridge National Laboratory that are still housed in temporary, inadequate buildings. Two major buildings, an East Research Building estimated to cost $4,680,000 and an addition to the existing Instrument Laboratory Building ($1,100,000) are proposed.

The present space situation at ORNL is critical and adequate permanent buildings are badly needed. At the present time approximately 600 laboratory employees are housed in 13 scattered, temporary structures that have long been scheduled for removal. These structures are very inadequate for the activities they house, widely dispersed, and present serious personnel and fire hazards. As a result, the coordination of related activities is difficult, the progress and efficiency of laboratory operations is impeded, and maintenance and operating expenses are excessive. This situation is becoming steadily more untenable as the buildings become older and as the research staff expands. The space requirements of the Laboratory have been carefully reviewed and the two buildings proposed in this project clearly appear to be the best solution to the existing problem. When coupled with other new facilities that have been authorized, the proposed new facilities will enable the Laboratory to raze nearly all temporary buildings.

The East Research Building in particular would enable the Laboratory to vacate 10 temporary buildings and provide for the consolidation of a number of related activities in suitable permanent quarters. Inasmuch as it would house only unclassified activities, it would also provide the Laboratory with a major facility that would be easily accessible to visiting foreign and domestic scientists. Its provision would greatly enhance the efficiency of many activities at the Laboratory.

The proposed addition to the instrument laboratory would consolidate instrument development activities and would do away with some temporary and makeshift housing. At the present time only about one-half of the ORNL Instrumentation and Controls Division is located in a suitable permanent building. The balance of the Division is housed in five different buildings. These quarters are seriously overcrowded or poorly located and the Division is particularly handicapped by the lack of suitable facilities for the assembly of large items of

equipment. In addition, there is a lack of suitable space facilities for component testing, instrument development, and for working with small quantities of radioactive materials. The Instrumentation Division is one of the most important supporting groups at the Laboratory and it is organized to perform both research and service functions. Its ability to perform its operations effectively, directly influences the overall program. The pressure on the Division are great and they are expected to increase as a result of the Laboratory's accelerated programs in reactor development.

7. Project 57–d–2—Bevatron research plant, University of California Radiation Laboratory, $1,084,000

This project provides for construction at the University of California Radiation Laboratory of: (1) an addition to the bevatron building for extension of the experimental area; (2) a building to house auxiliary services and provide a service and overhaul area for the bubble chamber; (3) additional radiation shielding; (4) necessary utility extensions; and (5) related minor modifications.

The bevatron research program is seriously restricted by the absence of suitable analyzing equipment and auxiliary facilities. When the bevatron was completed in 1954, only the minimum experimental capability was provided since not enough was known about the potentialities of the machine to properly design its accessories. Specific needs to permit the most effective use of the bevatron have now become apparent. New apparatus, including a large hydrogen bubble chamber and a proton beam deflection system, are being secured. An extension to the Bevatron Building will be required to enlarge the area used for experiments to provide space for use of the bubble chamber and deflected beam. Additional space is required for auxiliary services, including a service and overhaul area for the bubble chamber and a means of transporting the bubble chamber and magnet (120 tons) between the experimental area and the servicing area. These additional facilities will provide for better utilization of the beam since it would permit the movement of other pieces of analyzing equipment into the experimental space when the bubble chamber is removed. A remote hillside revetment for the safe storage of the liquid hydrogen supply will also be required. An expected one-hundred-fold increase in the intensity of the bevatron beam will require an additional band of shielding. Additional shielding will also be required for use with the deflected proton beam.

The estimate excludes $116,000 for architect-engineer work initiated in fiscal year 1956.

8. Project 57–d–4—Conversion of Accelerator Design Building, University of California Radiation Laboratory, $300,000

This project provides for conversion of the Accelerator Design Building now used for offices at the University of California Radiation Laboratory to an assembly and test area for the large magnets and research apparatus needed for bevatron research.

In order to fully utilize the bevatron as a research instrument, specialized experimental and research apparatus are required. At present, to assemble and test the apparatus, the accelerator must be shut down since this work must be done in the research area. This project will provide a ready area or staging area where large apparatus and the electronic setups may be assembled, tested, and checked prior to the actual experiment. This converted space will prevent the loss of operating hours now experienced because of shutdowns required for assembling and testing the apparatus in the bevatron research area.

9. Project 57–h–4—Engineering service building, University of California Radiation Laboratory, $1,080,000

This project provides for the construction of an engineering service building (55,000 square feet) at the University of California Radiation Laboratory to house engineering and service personnel who will be displaced from the Accelerator Design Building and those working in inadequate temporary buildings and other scattered locations.

To fully utilize the bevatron as a research tool, the Accelerator Design Building must be converted to a staging area for preparation and testing of bevatron apparatus. It is strategically located with respect to the bevatron. Also, it was originally designed and built for use ultimately as a part of the bevatron complex. The engineering group now housed in the Accelerator Design Building (occupying 31,000 square feet) will be displaced and must be relocated. Also,

certain service groups, now located in the Bevatron and Cyclotron Buildings, will be displaced to make available for research all possible space immediately adjacent to the bevatron and cyclotron. Other engineering and service groups have been temporarily housed in scattered locations throughout the laboratory area and should be centrally located for efficient operation. The relocation of these groups will make it possible to use the space vacated by these groups for the purposes originally planned.

The temporary buildings now occupied by the service groups (25,000 square feet) are converted, wooden, Navy barracks more than 15 years old. They are costly to maintain, ill-suited to the functions they house, inadequately heated, and are not capable of withstanding the floorloadings required.

10. Project 57–h–7—Addition to Heavy-ion Accelerator Building, University of California Radiation Laboratory, $200,000

This project provides for the construction of an addition to the Heavy-ion Accelerator Building to provide research space adjacent to the accelerator. Many of the targets after bombardment by this machine will have half-lives measured in fractions of a second and will be intensely radioactive. Under these circumstances, the targets must be analyzed quickly. The actual transportation and handling of the target material must be minimized to reduce the health, chemistry and physics hazards involved. Well equipped nuclear chemistry labs will be constructed in close proximity to the target area. This facility will provide these labs as well as providing a staging and test area and shop facilities needed for the heavy complex electronics equipment needed for the experiments.

11. Project 57–n—General plant projects, $1,520,000

This consolidated budget request provides for the minor and often individually unpredictable capital improvements, modifications, and additions that are required each year in conjunction with the research and development programs at the Oak Ridge National Laboratory, the Ames Laboratory, and the off-site physical research program. It also provides for an expansion of radioactive waste gas facilities and for an addition to the criticality facility at the Oak Ridge National Laboratory.

The funds requested for fiscal year 1957 may be listed as follows:

1. Oak Ridge National Laboratory	
(*a*) General plant items	$942,000
(*b*) Expansion of radioactive waste gas disposal facilities	157,000
(*c*) Expansion of criticality facility building 9213	196,000
Total	1,295,000
2. Ames Laboratory (general plant items)	50,000
3. Off-site research program	175,000
Total fiscal year 1957 obligations	1,520,000

General plant items, ORNL, $942,000.—The Oak Ridge National Laboratory does research and development in all fields of the atomic energy program. Each of the many activities has its associated capital requirements. In addition, the program is characterized by its rapidly changing nature. Each major change in direction or scope usually generates a demand for an alteration or addition to the physical facilities involved. The net result of both factors is an annual requirement for a substantial fund for minor capital items. The appropriate level of this fund is directly related to, and is determined by, the overall level in the operating program.

Expansion of radioactive waste gas disposal facilities, ORNL, $157,000.—This amount provides for an increase in the capacity of the radioactive waste gas disposal system at ORNL to meet additional requirements resulting from new programs and facilities. On the basis of a careful survey it is clear that the existing capacities of the cell ventilation and off-gas systems at the laboratory will not cover anticipated needs. With the advent of several new programs and the completion of the research reactor and Multicurie Fission Products Plant, additional fans and associated equipment will be required to relieve the overload and completely satisfy the needs of new facilities coming into operation.

Expansion of criticality facility, ORNL, $196,000.—This amount will provide a third test facility to increase the capacity of the ORNL Critical Experiments

Laboratory. A third facility is needed because of lack of sufficient space in the existing building. ORNL is equipped to perform criticality experiments for all types of power reactors and for other problems such as those encountered in determining the safety of methods for processing and shipping fissionable material. The studies performed are extremely important to the development and operation of various reactors, and production processes. At the present time, however, the criticality facility at ORNL is overtaxed. It only has two test cells, with each designed to accommodate a single experiment. This capacity is not adequate to satisfy current and anticipated needs. In recent months a number of important measurements have been delayed because of a substantial backlog. The proposed addition will allow a proportionate increase in the intensity of the activity and will permit more simultaneous experimentation. It will also reduce some of the inefficiencies now incurred because of a necessary shifting of apparatus from one setup to another as they are alternately activated in the present staggered schedule.

General plant projects, Ames Laboratory, $50,000.—An annual fund to cover minor capital requirements is also necessary for the Ames Laboratory. As research projects progress, change, or are terminated, and as new projects are initiated, relatively minor improvements or modifications are required. As in the case of other laboratories, it is not possible to predict the specific items to be covered under this caption, but the estimated level is based on past experience.

General plant projects, off-site physical research program, $175,000.—Under the off-site physical research program, about 10 contractors are using very large facilities such as cyclotrons, synchrotrons, and other particle accelerators. These facilities usually require modifications and additions as work progresses. Some changes are required to eliminate health hazards; others are required to permit better utilization of the devices.

GENERAL STATEMENT

Mr. FIELDS. We are estimating our constructions requirements for this program for fiscal 1957 at $13,832,000 for 11 projects. These projects provide for the construction of new research tools or modifying existing research tools. By this, I mean large accelerators or items of a similar nature. That is what we mean by the term "research tool."

We must also provide for the construction of certain new buildings and facilities at different installations, principally at the Oak Ridge National Laboratory and at the Brookhaven National Laboratory. These projects are to replace temporary buildings which are now being utilized. Large numbers of them involve high maintenance costs and inefficiency which we would like to avoid.

We believe that at these two laboratories in particular, we need to look at this time toward the construction of permanent facilities because of the long-term nature of their program.

Then, again, there are general plant projects to permit minor capital improvements in the plant facilities in the physical research program.

That, generally, is the statement that I would make at this time. It covers basically our research program which bears on peaceful uses as well as on military uses.

ESTIMATED AND ACTUAL OBLIGATIONS

Mr. CANNON. In the tabulation at the beginning of the justification, page 220, last year you estimated your obligation for fiscal 1955 for this program at $25,011,000. Your actual obligations turned out to be as indicated here, $13,704,109. You estimated your fiscal year 1956 obligation at $13 million. You now estimate it at $34,248,793. It seems to the committee that indicates a rather abrupt change in your plans. Will you tell us just why that has been necessary.

Mr. FIELDS. May I ask Mr. McCarthy to answer that?

Mr. CANNON. It is in the tabulation on page 220. Last year you greatly overestimated, and this year you completely underestimated.

Mr. MCCARTHY. The largest part of the difference is due to the deferment from 1955 to 1956 of part of the obligation for the cyclotron at Brookhaven. In our 1956 budget, we estimated that we would complete the obligations for the cyclotron at Brookhaven. We actually deferred $10 million of that obligation which now appears in 1956. This is the major reason for the shift, Mr. Chairman.

Another factor is that much of the cost of this machine, which is over $20 million, is for components assembled at the laboratory. This project will require a large magnet and other large components, on which design had not been completed, and procurement was shifted over to 1956. This is the major reason for the shift between the 2 years.

COMPARISON OF BROOKHAVEN NATIONAL LABORATORY WITH MODERN PHYSICS LABORATORY

Mr. CANNON. By way of contrast, comparing the Brookhaven National Laboratory with the more complete laboratories of the large universities today—and, of course, at the university laboratories, they require wider latitude for student space, which you do not require in this laboratory—how does this Brookhaven National Laboratory compare with our other leading universities?

In all our leading universities, we have physics laboratories which can be used for this purpose, and they would naturally be more expensive than your laboratories because they have to provide for student space. You do not have to do that. Taking that into consideration, how does this laboratory compare in both completeness and in cost with the modern university physics laboratory?

Mr. FIELDS. This laboratory has larger research tools than you would have at a university, such as the cyclotron and the alternating synchroton. You would not find these at an ordinary university. We must have much larger facilities for this reason.

Insofar as the physics laboratories or the chemical laboratories associated with these machines are concerned, they are also special facilities. There is not the requirement for student space; that is true. Nevertheless, they are laboratory facilities.

At the present time, we are occupying temporary buildings for the physical research program at Brookhaven. We feel they should be replaced by permanent laboratories, and that is part of the request included in this budget. I am not sure that I have given you the answer as to how they compare with universities.

Mr. CANNON. Your laboratories are for what might be considered postgraduate work?

Mr. FIELDS. Yes, sir, I believe so.

Mr. CANNON. Therefore, it would involve more expensive and intricate apparatus and equipment?

Mr. FIELDS. Yes, sir; our work would require the equipment associated with the experiments. I think this equipment would normally cost more than that which you would find in a laboratory for teaching the fundamentals to students.

Mr. CANNON. Would you say your project 57–h–1 is a revision? Would you consider it supplementary?

Mr. FIELDS. May I ask Dr. McDaniel, Deputy Director of the Research Division, to answer that.

Mr. MCDANIEL. The request here is for a supplementary building to the one which was in the budget last year.

Mr. CANNON. It is really a supplemental, or is it a complete revision of the project?

Mr. FIELDS. Mr. McCarthy, there was something last year, was there not?

Mr. MCCARTHY. There was an item for the conversion of a building in the Y–12 area last year. The one we are talking about here is located in what we designate as the X–10 area in Oak Ridge. Consideration is now being given to consolidating both projects in the X–10 area. It is therefore a modification of the project we had for this particular area. This is presently under study but the project we are requesting in 1957 stands on its own as a replacement of temporary buildings.

Mr. CANNON. It is replacement?

Mr. MCCARTHY. It is replacement.

Mr. CANNON. In the various construction projects at the University of California, which constitute quite an extensive proposition, will that be handled by a single contractor, or will it be handled separately by asking bids for each project individually?

Mr. FIELDS. The work there is all under the University of California. Certain modifications to the very powerful research tools like the Bevatron will be performed by the university.

Mr. CANNON. We are talking about construction. Would it be a better proposition to offer the whole thing to one contractor, or would you divide it up?

Mr. FIELDS. You would divide it up into a number of projects for buildings and let them on open bids from contractors.

Mr. CANNON. Would it be cheaper to let one contractor build the whole project? That is, ask all contractors to make one bid on the whole project instead of asking them to make bids on portions of the individual units?

Mr. FIELDS. We would contract for ordinary construction. What I want to emphasize is that some of the work on the large machine itself will be done by the university, because they have the most competent personnel on the maintenance and design of this complicated machine.

Mr. CANNON. It will be in the nature of a force contract?

Mr. FIELDS. They will let subtracts for some of the work. They will purchase steel on the open market, but it will be steel of a very special specification. As to the buildings themselves, it may be that all of the buildings should be constructed under one contract. This would be on invitation and open bidding.

Mr. CANNON. You have considered that proposition?

Mr. FIELDS. Yes, sir. Our normal practice is to advertise wherever we can.

Biology and Medicine Program—Construction and Obligations

JUSTIFICATION OF THE ESTIMATES

Mr. Cannon. Turning now to construction obligations for the Biology and Medicine Program, we will insert here pages 230 and 231 of the justifications.

(Pages 230 and 231 of the justifications follow:)

Biology and Medicine Program—Construction Obligations

Program statement

Estimated obligations, fiscal year 1957	$1, 138, 000
Estimated obligations, fiscal year 1956	6, 769, 429
Actual obligations, fiscal year 1955	787, 666

During fiscal year 1957, $1,138,000 will be required for necessary construction related to the biology and medicine program. Included are a reclamation and hot laundry plant at the Brookhaven National Laboratory and miscellaneous additions and alterations necessary because of research advances, for security and health reasons, and to improve efficiency of operations at the various locations under the cognizance of this program.

JUSTIFICATION OF PROJECTS FOR WHICH FUNDS ARE REQUESTED IN FISCAL YEAR 1957

Project No. 57-i-1—Reclamation plant and hot laundry, Brookhaven National Laboratory, $400,000

This project provides for two items, a reclamation plant and a hot laundry, to be housed in separate buildings but with common utilities and facilities such as liquid waste disposal, and common supervision (health physics).

Reclamation and laundry problems at BNL have up to now been handled with a minimum of facilities, frequently of a makeshift nature. The program has been experimental in nature and has lagged behind growing demands. The time has now come when the volume of equipment and materials to be cleaned has reached a point where adequate permanent facilities must be provided.

An indication of the rate of growth of these problems is given by shipments of contaminated waste (solid) for sea burial. The first shipment, a 4-year accumulation consisting of 50 drums (50 millicuries), was made in April 1952. In May 1955, a shipment covering an accumulation of approximately 1 year was 660 drums (500 curies). Reclamation problems show a similar pattern of increase. The case of the hot laundry, while somewhat different, is no less acute than the reclamation problem. Here also there was, at first, little to be done. A minimum amount of equipment was acquired (later increased) and installed in a wooden building in the old Army hospital area, close to the boiler house supplying steam to the area. Although several rearrangements of the equipment have been made, the building is still not suitable as a laundry; maintenance costs are high, deterioration is rapid, breakdowns are frequent, and decontamination very difficult.

The reclamation building is conceived as a simple rectangular structure, 50 by 80 feet, fireproof, with concrete-block walls and partitions, steel or reinforced concrete frame. The hot laundry will be of permanent construction, fireproof, about 50 by 70 feet. It will be located as close as possible to the boiler plant—main substation location in order to give short runs for the electrical, steam, and water utilities.

Project 57-n—General plant projects, $738,000

This project provides for miscellaneous alterations and additions, improvements, and minor construction at the various installations under the direction of the Division of Biology and Medicine. These include the Brookhaven National Laboratory, the Atomic Bomb Casualty Commission in Japan, the Oak Ridge Institute of Nuclear Studies, the Argonne Cancer Research Hospital, atomic-energy projects at the University of Rochester and the University of Tennessee, the Health and Safety Laboratory in New York, and off-site research projects at colleges, universities, and other research institutions throughout the country. The estimate is based on past experience at the several locations with consideration given to the size of the facility and the type of work performed.

It includes: improvements and modifications to major research tools such as the Brookhaven reactor, electrostatic accelerator, cyclotrons and cosmotron; a single entrance road and gatehouse, at the Brookhaven National Laboratory which will result in operational savings and reduction in personnel costs as well as in maintenance costs; minor additions, alterations, and construction at AEC laboratories to improve operating efficiency, reduce health and safety hazards, and to protect the Commission's investment in plant; minor construction at off-site laboratories to assist in special research studies.

Mr. CANNON. Would you care to discuss this program generally?

Mr. FIELDS. This is for construction obligations for the biology and medicine program. The estimate includes two projects. One is for the construction of a reclamation plant and hot laundry at Brookhaven National Laboratory. These are necessary because, at the moment, we are handling this work in minimum facilities. With the operation of additional machines and equipment, there will be an increased volume of equipment and materials to be processed. This is a service required by the Laboratory.

The second item is for general plant projects associated with the work of the biology and medicine division.

PROGRESS OF CONSTRUCTION OF MEDICAL RESEARCH CENTER AT BROOKHAVEN

Mr. CANNON. What progress have you made on the construction of the medical research center at Brookhaven?

Mr. FIELDS. Mr. McCarthy, can you answer that question?

Mr. MCCARTHY. I am not sure whether that construction has been put out for bids.

Mr. DERRY. It is now under construction.

Mr. CANNON. What progress is being made?

Mr. DERRY. Construction has just started. A contract was let last month.

Mr. CANNON. When does your contract provide for completion?

Mr. DERRY. The hot laboratory and hospital are scheduled for completion by October 1, 1957.

Mr. RABAUT. Did you say hot laboratory?

Mr. FIELDS. This is a reclamation plant and hot laundry.

Mr. RABAUT. You said laboratory

Mr FIELDS. I meant to say laundry.

GENERAL PLANT PROJECTS

Mr. CANNON. What will be called for on this general plant projects program? Cite a few instances.

Mr. FIELDS. May I ask the controller to answer that.

Mr. BURROWS. These include biology and medicine projects at the Brookhaven National Laboratory, University of Tennessee, and the University of Rochester.

Mr. CANNON. To what extent is this a duplication of the work of the Department of Health, Education, and Welfare?

Mr. BURROWS. This is not duplicated at all. This work is special to the particular techniques with which we are concerned.

Mr. CANNON. That department is conducting work of exactly this character. In what respect does your program on cancer, for example, differ from that of the Department of Health, Education, and Welfare?

Mr. BROWN. It differs in that we concentrate at Brookhaven on those applications of cancer research which involve the use of radioactivity and which require special tools such as a reactor and radioactive sources. We coordinate very carefully with the HEW to see that there is no duplication.

Mr. CANNON. HEW is not in a position to provide such facilities and makes no attempt to cover that phase of the work.

Mr. BROWN. The treatment of brain tumors requires techniques and knowledge that are not available at the moment in HEW.

Mr. CANNON. Is that true of these off-site research projects you are putting into effect?

Mr. BROWN. Yes. In the off-site cancer research program, we have a very small program amounting to about $150,000.

The general plant project funds for which we are making a request in this budget go beyond cancer and encompass the entire field of biomedical research.

There are some 450 contracts throughout the country, and the funds are for miscellaneous alteration and construction here and in Commission laboratories.

Mr. CANNON. That work is handled nowhere else?

Mr. BROWN. That is right.

Mr. KIRWAN. Do you have a contract with the National Institutes of Health, which is supposed to be about the best in the world? Do they do any work for you?

Mr. BROWN. We do not have a contract with them, but Dr. Dunham is a member of the various committees out there, so our programs are well coordinated.

BROOKHAVEN LAUNDRY

Mr. PHILLIPS. To what extent do you use that laundry?

Mr. BROWN. Take the hospital, for example. We are using radioactive material in the treatment of patients. As a consequence of using those materials, rubber gloves and gowns become contaminated.

Mr. PHILLIPS. I understand that. Do you wash all of the clothing? Do you wash the doctors' clothing?

Mr. BROWN. We wash everything.

Mr. PHILLIPS. Is it a special process?

Mr. BROWN. Yes, sir. We have to monitor the clothing to determine which clothing is contaminated and that which is not. The pieces of clothing which are contaminated require special precautions to see that the radioactivity is filtered out of the wash water before it is introduced into the sewage system.

Mr. PHILLIPS. That is what I was going to next ask you. What do you do with the water in which the clothing is washed?

Mr. BROWN. We wash it out through a central filtering system. If the activity is fairly high, we store the contaminated waste for a period of time until it decays to permissible levels of concentration.

COORDINATION OF RESEARCH

Mr. CANNON. You say there is no duplication between this work and the work of HEW? Is there any collaboration? Do you get together with them and exchange views and programs?

Mr. BROWN. Yes, sir; to this extent: Dr. Dunham, who is the Director of the Division, and members of our scientific staff visit HEW and the Public Health staff frequently to determine from them the nature of their program, and we consult with them on the work they are doing in the cancer field, for example, to make sure that we are not duplicating their work.

Mr. CANNON. Are you apprising them of your work and they, in turn, keeping you advised as to their work?

Mr. BROWN. Yes, sir; there is very close coordination.

Mr. RABAUT. Where do they not have a setup similar to that you claim you have in certain other places, such as in California, and so on? Why would you not have a setup similar to that which the Health Service has out at Bethesda?

Mr. BROWN. I do not believe that our functions are comparable, sir. If you are talking about the University of California, at Los Angeles, the project there is an atomic energy project in which we are doing some classified research in conjunction with the Nevada test program.

We are also doing some special research involving the use of radioactive materials in the treatment of patients. Again, it is highly specialized, involving techniques and materials not presently in use generally by the Department of Health, Education, and Welfare.

Mr. RABAUT. Here is the Government with a huge investment. Don't you feel that there should be more of a dovetailing, letting everyone find out what everyone else is doing? You say there is coordination only to the point that somebody over in your place sits on a board.

Mr. BROWN. I did not mean to convey that it was limited to that. The entire scientific staff of the Division endeavors to be cognizant of the kinds of research that are being supported by HEW. We are also advised by eminent scientists from outside the Commission. The Advisory Committee on Biology and Medicine is composed of eminent scientists. They also serve on other committees of the Government. They assist in advising on the types of research which the Commission should support, and they guide us away from any possible duplication with another agency such as HEW.

Mr. RABAUT. Do you feel that everything is being done for a close relationhip between your group and the Health Center?

Mr. BROWN. I would not want to say everything possible is being done. I would say that in the coming year we hope to do more than we have done in the past. We have been exchanging lists of projects with the National Science Foundation, which is another example. As our staff is augmented, perhaps we can have even closer coordination.

Mr. RABAUT. In the huge expenditures that Congress is making to find the answer to cancer, the one thing we are looking for is results. We expect the agencies of the Government that are dealing with this subject to do everything within their power to give their information to the others and to work together as far as possible to gain these results.

Mr. BROWN. I believe I can say that in the field of cancer there is complete cooperation.

Mr. RABAUT. If the agency feels that there has been anything lacking in the past, I hope they will give us a different report next year or at least an improved report.

PROGRESS IN CANCER RESEARCH

Mr. CANNON. How long has the Commission been studying cancer?

Mr. BROWN. Since 1947.

Mr. CANNON. That is practically 10 years. Have you discovered in that 10-year period anything as to the cause of cancer?

Mr. BROWN. No, sir; we have not.

Mr. CANNON. Have you discovered in that 10-year period how to avoid cancer?

Mr. BROWN. No, sir.

Mr. CANNON. Have you discovered any cure for cancer?

Mr. BROWN. No, sir.

Mr. CANNON. Since you have discovered absolutely nothing after 10 years, do you think it is worthwhile to continue?

Mr. BROWN. I am not a doctor of medicine, and I would not want to leave the impression that I am trying to practice medicine. We have learned a lot about the cell itself. Cancer is a disease of the cell. We know that radioactivity causes damage to the living cell. Conversely, we know that radiation, when placed in the hands of competent scientists and technicians, is a useful tool in the treatment of cancer. Certainly by the use of isotopes such as iodine–131, a lot has been achieved in the treament of thyroid cancer.

We have made progress at Brookhaven in treating maligant brain tumors. These have not been cures. We have brought in patients on whom surgery has been tried and failed. These patients have been exposed to the neutron beam of the reactor and each patient has experienced a temporary improvement.

At the moment, we are stymied for lack of a reactor which is peculiarly adapted to this type of research.

Congress appropriated for us last year funds to build a new medical research center and a first medical reactor. It will be the first reactor specifically designed for the treatment of patients. We hope that with this additional and better tool we can make better progress.

Mr. CANNON. As Mr. Rabaut has pointed out, we are interested in definite and accurate results.

Is cancer hereditary?

Mr. BROWN. Again, sir, I am not competent in that field, but my answer would be "No, sir; it is not."

Mr. CANNON. Is it communicable?

Mr. BROWN. No, sir.

COMMUNITY PROGRAM—CONSTRUCTION OBLIGATIONS

JUSTIFICATION OF THE ESTIMATE

Mr. CANNON. Turning now to Construction obligations for the community program," we will put in the record pages 232 and 233 of the justifications, and we would like to have you give us some information on that subject and the progress you have made.

(Pp. 232 and 233 of the justification follow:)

COMMUNITY PROGRAM—CONSTRUCTION OBLIGATIONS

Program statement

Estimated obligations fiscal year 1957	$3,920,000
Estimated obligations fiscal year 1956	8,587,962
Actual obligations fiscal year 1955	3,009,575

Community construction of $3,920,000 estimated for fiscal year 1957 provides funds for (1) construction of additional schoolrooms at Los Alamos, N. Mex., (2) annual recurring general plant projects for all AEC communities based on previous experience requirements for minor capital improvements, (3) construction, modification and expansion of municipal installations at Oak Ridge, Tenn., and Richland, Wash., authorized by Public Law 221, to provide necessary construction and modernization of community facilities prior to transferring these facilities to local government entities.

1. Project 57-j-2—Elementary school classrooms, Los Alamos, N. Mex., $195,000

The estimate provides financing for the construction cost of nine additional schoolrooms, including equipment and related space requirements for corridors, toilets, janitorial and storage space, and heating unit. The requirements for additional school facilities are based on a census of pre-school-age children, and a study of enrollment figures by schools and grade levels.

2. Project 57-n—General plant projects, all areas, $1,062,000

This project covers alterations, additions, replacements, and other general improvements of various types which are anticipated for schools, city roads and streets, sewerage system, municipal activities, water system, electrical distribution system, central steam plant, housing, business concessions, hospital, and other community facilities. Normal operating requirements in past years indicate the need for numerous capital items each year in order to provide the most economical operation of facilities at the various communities.

Obligation requirements for the various communities are detailed below:

Oak Ridge, Tenn	$307,000
Richland, Wash	220,000
Los Alamos, N. Mex	450,000
Sandia, N. Mex	25,000
Grand Junction, Colo	60,000
Total	1,062,000

3. Project 724-D-57 (18)—Municipal facilities, Oak Ridge, Tenn., disposal, $518,000

The estimate provides financing for construction, modification and expansion of municipal facilities authorized under Public Law 221. The project provides for construction of a combined city hall and central fire and police building presently housed in inefficient widely separate temporary frame buildings, modernization of wartime heating plants in public buildings and minor alterations to the public works building.

4. Project 723-D-57 (1)—Municipal facilities, Richland, Wash., disposal, $2,165,000

The estimate provides financing for construction, modification and expansion of municipal facilities authorized under Public Law 221. This project provides for construction of a city hall to provide necessary accommodations for municipal offices now widely dispersed in temporary structures, construction of a new fire substation to provide necessary fire protection services, installation of water meters in residential and commercial buildings to provide proper control of water usage, street improvements, replacement of water pipe, remodeling of community hospital, and procurement of related items of equipment.

5. Project 724-57-r—Retirement of community facilities, Oak Ridge, Tenn., —$20,000

This project represents income from sale of land to churches and sale of dormitories, with credits applied to community construction programs.

Mr. FIELDS. This estimate is for our requirements for the fiscal year 1957 in the amount of $3,920,000 and includes four projects.

ELEMENTARY SCHOOL AT LOS ALAMOS

The first is for an elementary school at Los Alamos, in the amount of $195,000. This addition is needed because of an increased number of students who will be of school age by the time we construct this project.

Mr. CANNON. Are you telling us, then, that your estimates here and your requisition for additional funds and additional classrooms is not based on the pupil-to-classroom ratio or increased personnel at Los Alamos, but it is merely based upon the increased number of children of school age per employee?

Mr. FIELDS. General Starbird can answer that.

General STARBIRD. During this past winter, we have actually made a house-to-house survey of the families in Los Alamos. As a result of that house-to-house survey, and making projections only with respect to a small number of houses not yet occupied we come up with 3,261 children who must be accommodated in the grammar school.

Mr. CANNON. Is that an increase of children per family or is that an increase in number of families?

General STARBIRD. It is largely attributable to an increased number of children per family.

Mr. CANNON. Your census indicates unquestionably the need for additional schools?

General STARBIRD. That is correct. We have tried to readjust within the school system, and that readjustment has been accomplished.

GENERAL PLANT PROJECTS

Mr. CANNON. On project 57–n, "General plant projects," would you comment on that, please.

Mr. FIELDS. That covers all communities.

Mr. CANNON. To what extent will this or any part of this $1,062,000 be expended for improvements that will eventually be sold? That is, are you putting money in facilities which the Government will later dispose of at a loss for the amount spent for the limited time in which you are in charge of this property?

Mr. MCCARTHY. There are amounts in here, Mr. Chairman, for both our communities at Oak Ridge and Richland, Wash. These amounts will be spent, mainly, on municipal facilities in the coming year to the extent that minor capital improvements are required.

Under the Community Disposal Act, these improvements will be turned over to the community government.

Mr. CANNON. How much?

Mr. MCCARTHY. The 2 amounts involved here total $527,000 and represent the amounts estimated for the 2 communities where disposal will be made and where they will be turned over to the municipal activities.

Mr. PHILLIPS. That figure does not correspond to anything I see here.

Mr. FIELDS. He is discussing the second project.

Mr. MCCARTHY. I am discussing the numbers on page 233.

Mr. PHILLIPS. The amount you are going to put into Richland is $2,165,000?

ADDITIONAL FACILITIES TO BE TURNED OVER TO COMMUNITIES

Mr. McCarthy. I was discussing only the general plant projects. The next projects are specific amounts authorized under the Community Disposal Act to provide certain additional facilities to be turned over to the community so that it will be in a going state. The estimates of $518,000 for Oak Ridge, and $2,165,000 for Richland are for such additional facilities. They are specific items which were determined to be necessary to turn over to the communities in a going state.

Mr. Phillips. Even taking the 2 items to which Mr. McCarthy first referred, which would make $527,000, the fact would seem to be apparent that the longer the present dwellers in these houses resist any effort to force them to buy or sell their houses to somebody else, the more they expect the Federal Government to put into the project for which they will not subsequently be taxed.

Mr. McCarthy. Mr. Phillips, the amounts we are talking about here are concerned with the municipal facilities which will be turned over to the community government at both Oak Ridge and Richland. In both cases the plan is underway for the residents to incorporate as a community.

COMMUNITY DISPOSAL

Mr. Phillips. The longer they can delay that, the more you will spend, which, if the city were incorporated and the residents were taxpayers like all of the rest of us, they would have to pay for themselves.

Mr. McCarthy. They would have to pay taxes to the municipality. The thought behind the Community Disposal Act is to turn over to them a debt-free community.

Mr. Phillips. You do not expect to recover any of this money?

Mr. Fields. No, sir. The only recovery will be on the sale of private housing and concessionaire facilities in accordance with the Community Disposal Act. This act provides that the municipal facilities would be donated to an incorporated unit.

Mr. Phillips. As Mr. Rabaut pointed out the other day, it is a rather peculiar method, selling the houses individually so they can pick out the cream of the crop and leave the Government holding the unsalable or less desirable houses. On top of that, we turn over all of the facilities to the people who have bought these houses, and we do not even take a bond issue for what we have invested in the project even during the time that we have been talking about selling. So, I come back to my original statement. The longer these people can resist having to buy these houses the more the Federal Government will have poured into it without reimbursement, and the less they would have to pay, like the normal residents of any community, for the facilities which they themselves use.

Mr. Fields. The desirability from the Government standpoint of getting on with the disposal is high.

Mr. Phillips. Why do you not adopt Mr. Rabaut's suggestion which is normal in selling large areas, selling a large block whether it is good, bad, or indifferent?

Mr. Fields. The problem is to dispose of these two communities and yet, to keep them in a condition which will attract the personnel who

are necessary to operate the plants. There is still a requirement for production workers at both Hanford and at Oak Ridge and there will be for a considerable period of time.

The Joint Committee, as you probably know, held rather extensive hearings on this subject last year, both in the communities and here in Washington. As a result of those hearings, the Congress passed legislation which we have tried to reflect in this budget. Our attempt has been to follow that legislation.

Mr. PHILLIPS. You are not suggesting that the average American homeowner is not capable of maintaining his life without the direction, help, and supervision of the Federal Government, are you? You just said practically that. You said your object was to see that these houses were maintained in that condition that would attract people to Richland or to Oak Ridge.

Mr. FIELDS. The problem here is that you are disposing of two entire communities. At the same time, these people do not necessarily plan to stay there all their lives. You are, in effect, forcing them to buy a house if they want to stay there for 2 or 3 years.

Mr. PHILLIPS. You never heard of anybody buying a house and renting it to somebody else?

Mr. FIELDS. This will probably happen, but the plan has been set up to sell to individual purchasers, to the families living in those quarters. The act does give them certain benefits in an attempt to induce them to buy their house and stay in our employ.

Mr. PHILLIPS. Do you not see the fallacy of letting them buy off the cream, and that is going to leave you stuck with the less desirable properties; and this committee will be asked for the next 10 years to appropriate money for the employees and the necessary supervision and maintenance of these housing projects which the Congress instructed you to get rid of?

Mr. CANNON. I do not think we can emphasize too strongly the last statement made by Mr. Phillips. As you say, for 10 years to come we will have to deal with this problem on an increasing basis.

Mr. RABAUT. We know that this is not your doing, but it is not a very good thing at all for the Government, because the houses that will be taken will be the cream of the houses. The houses that will be left will have to be sold then at option or some sort of giant sale. Then the people who bought the other houses which are going to be somewhat identical to the houses, because of preference of location or something, will figure that if they had waited, they would have gotten their houses cheaper. It is going to be bad for the Government and the project. The thing should be sold to some group, and then the rights given to the individuals who are in that so that they can take it from the group at a certain figure. The group that takes the whole place should also take over the facilities and the care of all the buildings to run the town. With the Government running the facilities for 5 years, and so on, you know that is just going to be a lot of endless trouble and tremendous expense.

When the thing is consummated, it ought to be consummated in a businesslike manner. I do not say you people did this. Other agencies were called in to testify about this.

Mr. CANNON. You understand that you can take off the record any part of this discussion.

We have just 1 or 2 items remaining. Would the committee care to recess now or shall we finish the remaining items?

Mr. JENSEN. In line with the questioning that has just taken place, does the law which Congress passed provide that the utilities in the town shall be held in Government ownership for any particular length of time?

Mr. FIELDS. No, sir. It contemplates the donation of these facilities to the municipal body on incorporation and the establishment of a government to run the community.

Mr. JENSEN. I cannot understand why any lawmaker would pass such a law. Certainly I did not know of it at the time, and I am sure very few of us did.

After the town is incorporated, they should be willing to bond themselves for the utilities, sewers, light, heat, water, just as any other town bonds itself, and then accept a bonded indebtedness in that amount, in a reasonable amount. Perhaps it could be at 75 percent. If we had done that, then the sale price of the home could have been reduced. Those utilities are there not just for the present time or 5 years or 10 years; they are there for a person's lifetime, as they exist today. For a person to buy a piece of property there and sell that property, he is not obligated in any way, shape, or form to a tax that would be imposed because of a bonded indebtedness. That should be some incentive for people to buy the home even though they cost a little more. I can understand that. It might be that in the long run it would offset each other, but just why those towns should not have a bonded indebtedness, just like any other town, I do not know. I do not suppose anybody here can explain why that was done. The law provides, does it not, that the utilities shall be donated?

Mr. FIELDS. The law says they may be donated. The legislative history indicates that they would be.

Mr. MCCARTHY. Section 81 provides that the Commission is authorized to make such transfers over a period not to extend beyond 5 years. This is on page 10, section 82:

> The Commission is authorized to transfer to one or more of the entities specified in this chapter such municipal installations as in the judgment of the Commission would be appropriate to enable the transferees to meet the needs of the community for adequate school, hospital, and other municipal services.

Mr. JENSEN. It is a bad act that you have to deal with, in the first place. You have quite a problem, as I see it. I would say this, just like I said about another project up at Grand Coulee which we were attempting to dispose of. I finally got to the point where I said, "Sell it; get what you can for it. The quicker Uncle Sam gets out of it, the less it will cost Uncle Sam." I would make the same recommendation here. Set up a program to get rid of it; sell it and let Uncle Sam get out of the business.

Every year it is going to cost us more and more. My recommendation would be that you just get rid of it as fast as you can even though you cannot get what it is worth, because Uncle Sam is going to be the loser every year that it is in our possession.

Mr. RABAUT. We were reading that the Commission is authorized to transfer to one or more of the entities specified in this chapter such municipal installations as in the judgment of the Commission would be appropriate to enable the transferees to meet the needs of the community for adequate school, hospital, and other municipal services.

How do you interpret that?

Mr. FIELDS. That it is an authorization to do this.

Mr. RABAUT. Why do we wait then for a period of 5 years before we do it? Why do we bear the expense for this period of time?

Mr. FIELDS. The act goes on to prescribe certain assistances to these local entities. They have not as yet been formed. We are not in a position to go further. They have not been incorporated.

Mr. RABAUT. It is proposed to hold on to them for 5 years. That was said here the other day.

Mr. FIELDS. No, sir. I think the transfer would take place as soon as they became capable of taking over. I do not think it is limited to 5 years.

Mr. CANNON. What would the gentleman suggest?

Mr. RABAUT. I would suggest that the committee have this thing looked into with the idea of probably calling the agency before us that made the suggestion.

Mr. CANNON. Without objection, we will ask the gentleman from California, Mr. Phillips, to collaborate with Mr. Rabaut on this and provide for either an investigation or further hearing on it.

ADMINISTRATION CONSTRUCTION

HEADQUARTERS BUILDING

Let me ask you in this connection, General Fields, you have your new headquarters under construction out in Maryland. Since the majority of your higher salaried employees will continue to live at their present residences, do you have any idea whether this change is made with the expectation of protecting them from possible bombing?

Mr. FIELDS. We are following considerations for dispersal of Government facilities which basically, is to get them out of the city itself. We believe there will be in time a gradual relocation of our key personnel away from the city. There are undoubtedly a lot of them who will not move for some years, but I think the trend will be to locate farther away from the city than they are at present.

The basic reason for dispersal was to be located in an area where we were less susceptible to damage from an attack on Washington, D. C.

OAK RIDGE MUNICIPAL BUILDING

Mr. JAMES C. MURRAY. Do you know of any unincorporated city in the United States which has a combined city hall, fire and police building?

Mr. FIELDS. I do not know of any myself. This program is looking toward incorporation and the installation of a municipal government at Oak Ridge.

Mr. JAMES C. MURRAY. A city in its governmental functions is an arm of the State. Can we build a city hall, fire and police building before there is a city in existence?

Mr. FIELDS. Is it contemplated in the authorization included in the act.

Mr. JAMES C. MURRAY. The authorization does not define specifically buildings. It defines hospitals—you are going into municipal buildings. Hospitals are proprietary in nature while a city hall and

the like is governmental. A city is not in existence until you have incorporation.

Mr. FIELDS. These facilities were discussed in conjunction with the act and are the type for which the authorization was made. It was included in the act.

In order that there be a municipal facility for the incorporated body when it is formed, this was included.

I don't think the Federal Government has the authority to build a city hall or police building for a city and especially for a nonexistent city.

Mr. JAMES C. MURRAY. I notice in your program that you contemplate street improvements. In a great many States—I do not know if it is true in these particular States—once the property owners have installed the streets, the motor fuel tax of the State becomes obligated for maintenance of the street. I wonder if we are not appropriating money for improvements that are already entitled to be improved under motor fuel tax funds of those States.

Mr. FIELDS. I do not believe I can answer that. Could you answer it, Mr. Ohlke?

Mr. OHLKE. I believe it will vary from State to State as to what the tax structure is and what revenues support the various facilities and services.

In the particular case you mentioned, these are actual cities now in existence. The city of Richland is the eighth largest city in the State of Washington; and Oak Ridge is the fifth largest city in Tennessee.

Mr. JAMES C. MURRAY. Is this within the corporate limits of the city of Richland?

Mr. OHLKE. There are no corporate limits. It is a Federal reservation. The houses and facilities are there. Some of the streets are there, but there is not adequate drainage. Some sidewalks and curbs are missing.

As far as the State support of these facilities is concerned, they have been looked into very carefully. There is some State support now available. As a matter of fact, a large part of the school support in the city of Richland comes from the State at the present time. However, as of now, there is no State money available for the roads and streets within the community either at Richland or at Oak Ridge.

Mr. JAMES C. MURRAY. Are the residents of this community then relieved of paying State highway and gasoline taxes?

Mr. OHLKE. No, sir. They pay the taxes on the fuel and gasoline.

Mr. JAMES C. MURRAY. I do not understand that. If they pay the gasoline taxes, should not the State maintain the streets out of the gasoline tax?

Mr. OHLKE. The roads and streets that are within these communities are federally owned, and the county participates on certain access roads to the area, but within the area, the Federal Government supports all community services.

Mr. JENSEN. Will the gentleman yield?

Mr. JAMES C. MURRAY. Yes, I will yield.

Mr. JENSEN. I think the gentleman has hit upon a subject that is quite interesting. I think you will find that those towns that are federally owned have suffered. The contribution from your gasoline tax, the benefits, has been made up by the Federal Treasury. Without a doubt, many of those streets, or at least a portion of them, should receive Federal highway aid just like any other municipality receives.

Mr. Chairman, 2 or 3 men who are well versed and who have had experience in municipal government could, in a very short time, go into those towns about which we have spoken here, and which are in question, and they could give us a report on which we could act intelligently. That is your purpose, I presume.

Mr. CANNON. That will be a part of the work which Mr. Rabaut and Mr. Phillips are undertaking. We would be glad if you would collaborate with them in making these arrangements.

JUSTIFICATION OF THE ESTIMATE

I neglected to say that when he began discussion of obligation of administrative construction that we should insert pages 234 and 235 of the justification.

(Pp. 234 and 235 of the justification follow:)

ADMINISTRATIVE CONSTRUCTION—OBLIGATIONS

Program statement

Estimated obligations fiscal year 1957	$1,117,000
Estimated obligations fiscal year 1956	9,995,000
Actual obligations fiscal year 1955	5,000

Administrative construction of $1,117,000 estimated for fiscal year 1957 provides for a headquarters building urgently required for the Albuquerque Operations Office and for a combined warehouse and work area for the Technical Information Services at Oak Ridge, Tenn., made necessary by the increased volume of technical reports under the atoms for peace program. Each of these facilities will be made available by the conversion of existing buildings.

JUSTIFICATION OF PROJECTS FOR WHICH FUNDS ARE REQUESTED IN FISCAL YEAR 1957

1. Project 57-k-1—Conversion of barracks for Albuquerque Operations Office headquarters, Sandia Base, Albuquerque, N. Mex., $600,000

This project provides for vacating 4 buildings presently occupied and for the remodeling and conversion of 4 barracks buildings, centrally located on the Sandia Base, to provide 88,000 square feet of space (net) for offices, conference rooms, central files and for other administrative functions.

It has been necessary to administer the programs at the Albuquerque Office from four widely dispersed, overcrowded, and poorly constructed office buildings. The most adverse feature of these conditions is that top staff members having need to confer on official matters are unable to do so except by telephone without spending extra time traveling between buildings. Telephonic communication is inherently of limited assistance in exchanging ideas and discussion of matters relating to restricted data.

The availability of central headquarters building will result in an annual reduction in costs of approximately $56,000 through more efficient use of guards and janitors, elimination of courier and shuttle services between the existing buildings, reduced utility and maintenance costs and will provide for more effective operations.

2. Project 57-k-2—Renovation of buillding for Technical Information Services, Oak Ridge, Tenn., $517,000

This project consists of alterations required to convert a portion of an existing permanent warehouse to provide approximately 73,000 square feet of suitable floor space in one location for the Technical Information Services at Oak Ridge. At present the Technical Information Services occupies 51,000 square feet of space in 4 different buildings, extending over a distance of 3 miles. Crowded conditions are prevalent throughout the space now occupied, particularly in the printing plant and related work areas. Consolidation of all functions in one building containing adequate contiguous space with improved technical facilities will also provide the required additional space for the division's expanding functions resulting from the industrial participation and atoms for peace programs.

HEADQUARTERS BUILDING

Mr. CANNON. You are planning to construct a new building at Germantown. Why are you specifying it shall be shock-resistant?

Mr. FIELDS. Blast-resistant to a certain extent.

Mr. CANNON. Will this have the effect of reducing your usable working areas?

Mr. FIELDS. The work area should be adequate as now planned. It does call for reinforced concrete construction.

Mr. CANNON. You take that into consideration?

Mr. FIELDS. Yes, sir.

Mr. CANNON. Do you have a definite amount authorized? In order to make this building shock-resistant, would you consume an unexpected amount of the funds available?

Mr. FIELDS. No, sir.

Mr. CANNON. I wish you would furnish for the record, General Fields, the dimensions and area for the following facilities that are intended to be incorporated in your Germantown building: cafeteria, auditorium, main lobby, library, and commissioner's offices. When your remarks come to you for correction, give us in dimensions and area provisions for those various facilities.

(The information referred to follows:)

The dimensions for the selected areas of the AEC headquarters building being constructed at Germantown, Md., are as follows:

NEW GERMANTOWN HEADQUARTERS BUILDING

Area calculations

Area and dimension	Area in square feet		Remarks
	Gross	Net use	
Cafeteria (2-story building), 101 feet 7 inches by 109 feet	20,800		
Seating area only:			
50 by 100 feet	(1)	5,000	Main dining room, seating 350.
50 by 31 feet	(1)	1,550	Table service, dining-room, seating 100.
20.5 by 48 feet	(2)	984	Lunchroom, seating 100.
Auditorim (1-story building):			
Main building, 82.5 by 70 feet	5,775		
Stage, 18 by 49 feet	882		
Mezzanine, 70 by 30 feet	2,100		
Cellar floor, 70 by 30 feet	2,100		
Total gross area	10,857		
Say	11,000		
Seating area, 52 by 70 feet		3,640	Seating 300.
Main lobby, 61 by 28 feet		1,708	
Libraries:			
Classified, 15 feet 3 inches by 47 feet 6 inches		2,248	
Technical, 155 feet by 30 feet 6 inches		4,785	
Law, 27 feet 6 inches by 170 feet		4,675	
Commissioners:			
Chairman's office, 30 feet by 30 feet 6 inches		915	
Chairman's reception, 28 feet by 14 feet 8 inches		409	
Chairman's secretary and staff, 40 feet by 14 feet 9 inches.		584	
Commissioners' office, 25 feet 6 inches by 14 feet 8 inches.		372	
Commissioners' waiting room, secretary and staff, 33 feet 6 inches by 14 feet 8 inches.		490	
Commissioners' general waiting room, 14 feet 8 inches by 24 feet.		350	
Commissioners' dining room and kitchen, 50 feet by 15 feet.		750	
Commissioners' conference room, 35 feet by 37 feet 6 inches.		1,312	

[1] First floor. [2] Ground floor.

SANDIA OFFICE BUILDING

Mr. CANNON. With respect to project 57–K–1, which is conversion of the barracks at the Sandia Base to an operations office, will the number of administrative personnel at the Albuquerque Operations Office be greater or less by the time this construction work is completed?

Mr. FIELDS. The number will be slightly increased; but not by any large amount, sir.

Mr. CANNON. Referring to 57–K–2 on page 235, is the need for increased space for the Technical Information Service related principally to the "Atoms-for-peace" program or to the "Civilian applications" program?

Mr. FIELDS. They are both involved in this in that they are both expanding.

Mr. CANNON. You would not say that one is to be emphasized at the expense of the other?

Mr. FIELDS. No, sir. In fact, they are quite closely related.

LANGUAGE CHANGES

Mr. CANNON. Next we have on page 180 the proposed language changes. We will include at this point pages 180 and 181.

(The pages of the justification follow:)

PLANT ACQUISITION AND CONSTRUCTION

EXPLANATION OF PROPOSED LANGUAGE CHANGES

Proposed changes in language are indicated as follows: Language enclosed in black brackets indicates proposed deletions, and italic indicates proposed insertion of new language.

1. "Plant [and Equipment] *Acquisition and Construction.* For expenses of the Commission in connection with the purchase and construction of plant [and the acquisition of equipment] and other expenses * * * [purchase of aircraft; purchase (not to exceed four hundred and seventy-nine for replacement only)] and hire of passenger motor vehicles;".

The phraseology deleted results from the proposal to fund equipment not included in construction projects in fiscal year 1957 from the appropriation "Operating expenses," whereas prior to fiscal year 1957 this program has been funded from the appropriation "Plant and equipment." The appropriation "Plant and equipment' is retitled "Plant acquisition and construction," and the language authorizing the purchase of aircraft and motor vehicles is deleted and now appears in the language for "Operating expenses."

2. "[$256,327,000] *$158,300,000,* to remain available until expended [and $2,900,000 which shall be available for the construction of a community hospital at Oak Ridge, Tennessee: *Provided,* That in addition to transfers otherwise authorized by law, $90,000,000 of unexpended balances available under this head shall be transferred to the appropriation "Operating expenses, Atomic Energy Commission."]

The amounts appropriated in fiscal year 1956 are deleted and the amount of the fiscal year 1957 appropriation is inserted; further, the transfer authority is deleted since no similar transfer is contemplated in fiscal year 1957.

3. *: Provided, That the obligated balance as of June 30, 1956, of amounts included in appropriations to the Atomic Energy Commission for plant and equipment for the activity "Equipment not included in construction projects" shall be transferred to and merged with the appropriation for "Operating expenses," and the remaining balance of such appropriations shall be merged with this appropriation:*

This new language is required to implement the proposal to fund equipment not included in construction projects from the appropriation "Operating ex-

penses" in fiscal year 1957 and discontinues the use of the appropriation title "Plant and equipment." The language provides for the obligated balances for equipment not included in construction projects as of June 30, 1956, to be transferred to the appropriation "Operating expenses" so that all expenditures for such equipment can be made from that appropriation effective July 1, 1956. The amounts to be transferred will be those recorded on AEC books as of June 30, 1956, as shown on the status of allotment reports for that date which are submitted to Washington by the field offices shortly thereafter. The language further provides for the remaining unexpended balances under the appropriation "Plant and equipment" as of June 30, 1956, to be transferred to the new appropriation "Plant acquisition and construction."

4. *Provided further, That in the event additional feed materials capacity is constructed by private industry with its own funds, the amounts included in this appropriation for such construction may be transferred to the appropriation "Operating expenses":*

The estimates for fiscal year 1957 for "Plant acquisition and construction" includes funds for the construction of additional feed materials facilities. Proposals from private industry are being considered by AEC whereby private industry would construct the facilities with its own funds and AEC would enter into unit price contracts for the procurement of feed materials. If these proposals are accepted, funds would not be required by AEC for construction, but would be required under the appropriation "Operating expenses" to provide for procurement. In this event, the proposed language will provide the authority for the transfer of these funds from the appropriation "Plant acquisition and construction" to "Operating expenses."

5. "*: Provided further, That $24,100,000 of this appropriation shall be available only upon enactment into law during the second session of the 84th Congress of legislation authorizing appropriations for a power reactor development acceleration project and an increase in the cost of project 57–e–2 for research and developmental test plant.*"

Legislation authorizing appropriations for the construction projects cited in the above proviso is now pending before the Congress. The provision provides that the amount included in these estimates for the projects would not be available to the Commission until the legislation authorizing such appropriation is enacted into law.

GENERAL STATEMENT

Mr. McCarthy. The language, as you see, has been amended from previous years to effect the change in the plant acquisition and construction. This change moves the authority for equipment procurement, as we discussed previously, to our operating program. That change in language is affected by the rewrite as shown on page 179. The italics at the end of the new language indicate two new provisions. The first would provide that the amounts obligated as of June 30 this year for equipment may be transferred to the operating appropriation for the purpose of permitting us to liquidate all equipment obligations of prior years from the same account as for new procurement of equipment in 1957. This change would permit us to transfer those unpaid balances outstanding for equipment purchases so as to permit us to liquidate all obligations for equipment under the operating appropriation.

Mr. Cannon. In event private industry submits a proposal which you regard as satisfactory, you would want to transfer this money for expansion of feed materials processing to the operating expenses appropriation and use that amount for the purchase of material.

Mr. McCarthy. That is correct.

Mr. Cannon. Are you suggesting that the operating expenses you have requested are insufficient to provide for their procurement?

Mr. McCarthy. No, sir. The main purpose of this change relates to the type of proposals we may get if industry constructs this plant. They would want a provision in the agreement to protect them in the event we cancel. We would have to guarantee to pay off part of the plant.

Mr. Cannon. What are the funds necessary for its operation in the event it is an AEC plant?

Mr. McCarthy. There is no provision in here for operating costs at the moment because this plant will not have been constructed in 1957. The operating cost for the plants would come to roughly 8 or 9 million dollars per year.

LEASE OF EQUIPMENT

Mr. Rabaut. Do you lease any equipment?

Mr. McCarthy. From industry?

Mr. Rabaut. Yes.

Mr. McCarthy. Not that I am aware of. We do only in isolated cases.

Mr. Rabaut. Do you lease any bookkeeping machines or anything like that?

Mr. McCarthy. We do lease IBM equipment.

Mr. Rabaut. Do you feel you are getting a fair charge in that case?

Mr. McCarthy. So far as I am aware, sir, we are.

Mr. Rabaut. That question has been up here on the Hill a few times.

Mr. Jensen. I am not sure the AEC have anything to do with the charge. They do not determine the amount that they pay.

Do you deal directly with IBM?

Mr. Fields. On computers: yes, sir.

Mr. Rabaut. The big trouble with these machines is that the rental is high and sometimes I think it is too high, particularly to the Government, which is the best customer they have.

The agencies that do rent those machines should see to it that they are put to maximum use. There should not be a number of machines which get only part-time or minimal use.

Mr. Fields. Most of the machines are being used 24 hours, around the clock.

STATUS OF OBLIGATIONS AND EXPENDITURES

Mr. Phillips. Mr. Chairman, I may have missed this in the earlier questioning, but did you ask them to provide a statement of the unexpended balances and the uncommitted balances?

Mr. Cannon. We will do so at this time. Indicate what you think should be in here.

Mr. Rabaut. The same as last year.

Mr. Jensen. For each branch of your agency.

Mr. Fields. For the two appropriations.

(The information requested follows:)

Analysis of funds available for obligation in fiscal year 1957

[In millions]

	Total	Operating expenses	Plant acquisition and construction
Estimated unexpended balance at June 30, 1956	$1,389.7	$653.6	$736.1
Less unpaid obligations at June 30, 1956	1,201.4	613.6	587.8
Unobligated balance available for 1957	188.3	40.0	148.3
Appropriation requested for fiscal year 1957	1,898.7	1,740.4	158.3
Funds available for obligation	2,087.0	1,780.4	306.6

Amounts available for expenditures, expenditures, and unexpended balances

[In millions]

	Actual, fiscal year 1955	Estimate, fiscal year 1956	Estimate, fiscal year 1957
OPERATING EXPENSES			
Unexpended balance, beginning of year	$841.9	$902.2	$653.6
Appropriation	1,099.0	575.0	1,740.4
Transfer from "Plant and equipment"	0	571.4	0
Total funds available	1,940.9	2,048.6	2,394.0
Expenditures (deduct)	1,038.7	1,395.0	1,667.0
Unexpended balance, end of year	902.2	653.6	727.0
PLANT ACQUISITION AND CONSTRUCTION			
Unexpended balance, beginning of year	2,036.1	1,328.3	736.1
Appropriation	110.9	259.2	158.3
Transfer to "Operating expenses"	0	(571.4)	0
Total funds available	2,147.0	1,016.1	894.4
Expenditures (deduct)	818.7	280.0	313.0
Unexpended balance, end of year	1,328.3	736.1	581.4

Mr. CANNON. The witnesses from the Commission are now dismissed until 10 o'clock on Monday morning.

The members of the committee will return at 2 o'clock this afternoon for a special discussion.

Mr. FIELDS. Shall I have the other program directors here? Are you primarily concerned with power?

Mr. CANNON. You may consult with committee counsel on that.

TUESDAY, JUNE 19, 1956.

DEPARTMENT OF THE INTERIOR

SOUTHEASTERN POWER ADMINISTRATION

WITNESS

CHARLES W. LEAVY, ADMINISTRATOR

OPERATION AND MAINTENANCE

Program and financing

	In budget, 1957	Revised estimate, 1957	Increase (+) or decrease (−), difference
Program by activities:			
1. System operation and maintenance	$75,000	$75,000	
2. Purchase of energy and wheeling charges	1,134,000	1,634,000	+$500,000
3. Power contracts and rates	89,500	89,500	
4. General administration	79,500	79,500	
Total obligations	1,378,000	1,878,000	+500,000
Financing: Appropriation	1,378,000	1,878,000	+500,000

Obligations by objects

Object classification	In budget, 1957	Revised estimate, 1957	Increase (+) or decrease (−), difference
Total number of permanent positions	39	39	
Average number of all employees	38	38	
Number of employees at end of year	39	39	
01 Personal services	$219,000	$219,000	
02 Travel	10,500	10,500	
04 Communication services	5,500	5,500	
07 Other contractual services	1,136,000	1,636,000	+$500,000
08 Supplies and materials	4,000	4,000	
09 Equipment	3,000	3,000	
Total obligations	1,378,000	1,878,000	+500,000

Mr. CANNON. The committee will come to order.

Gentlemen, we have met this afternoon for the purpose of considering three supplemental requests by the Department of the Interior.

PAYMENT OF WHEELING FEES

The first item for consideration is the request by the Southeastern Power Administration and we are pleased to have with us at this time Mr. Charles W. Leavy, Administrator.

At this point in the record we will insert the pertinent section of House Document 420 and the justifications.

(The information follows:)

"DEPARTMENT OF THE INTERIOR

"OFFICE OF THE SECRETARY

"OPERATION AND MAINTENANCE, SOUTHEASTERN POWER ADMINISTRATION

"For an additional amount for 'Operation and maintenance, Southeastern Power Administration', $500,000."

This proposed supplemental appropriation is necessary in connection with the Clark Hill project, for carrying out the provisions of a recently executed contract with a private utility company to transmit federally generated power over its facilities to preference customers in the State of Georgia.

OPERATION AND MAINTENANCE, SOUTHEASTERN POWER ADMINISTRATION

(H. Doc. 420)

Request for 12 months from July 1, 1956	$500,000
Appropriation to date	
Obligations to ———	
Expenditures to ———	
Budget estimate next fiscal year	
Employment:	
Average number, current appropriation	
Number involved this estimate	None
Actual employment ———	

PURPOSE AND NEED FOR SUPPLEMENTAL FUNDS

The supplemental estimate of $500,000 is required to meet contractual commitments with the Georgia Power Co. for payment of wheeling fees for transmission of power generated at Clark Hill Dam over the facilities of the company.

"OPERATION AND MAINTENANCE, SOUTHEASTERN POWER ADMINISTRATION

"For an additional amount for 'Operation and maintenance, Southeastern Power Administration', $500,000."

JUSTIFICATION

Due to the execution of the wheeling contract with the Georgia Power Co., there will be need for additional funds in the amount of $500,000 for the appropriation "Operation and maintenance, Southeastern Power Administration," for fiscal year 1957. This additional amount would increase the originally requested appropriation from $1,378,000 to $1,878,000.

The original request for operation and maintenance funds for fiscal year 1957 included $1,134,000 for purchase of energy and wheeling charges. Of this amount $950,000 was requested for payment of wheeling charges and purchase of firming energy under the wheeling and firming contract with Virginia Electric & Power Co. This amount is based on the average dollar requirement if the contract had been in operation and serving the estimated 1957 requirements of the preferred agencies being served during the 22 years for which actual water records are available. $184,000 of the funds requested for payment of wheeling charges under the wheeling contract with Carolina Power & Light Co. This is the amount estimated to be required for this purpose during fiscal year 1957 based on average water conditions. No funds are required under that contract for purchase of firming energy since such energy is sold by the company directly to preferred agencies.

The contract executed with the Georga Power Co., like the Carolina Power & Light Co. contract, will require funds for the payment of wheeling fees only since firming energy will be sold by the company directly to preferred agencies. The $500,000 requested for payment of wheeling fees under this contract is based on the estimated requirement for fiscal year 1957 assuming that average water conditions prevail. The contract provides for the wheeling of power from the Clark Hill project to public bodies and cooperatives in the service area of the Georgia Power Co. The preferred agencies involved include 45 public bodies, 34 of which have applied for Clark Hill power, and 37 rural electric cooperatives, all of which have applied for Clark Hill power. Since the loads

of the applicants far exceed the amount of power available from the project for wheeling to such agencies, it may be assumed that the entire amount available for this purpose will be wheeled under the contract and sold to preferred agencies.

Shown below are the estimated monthly costs that will be incurred under the contract for energy to be transmitted to preferred agencies located in the service area of the Georgia Power Co.

Month	Energy wheeled megawatt-hours	Cost	Month	Energy wheeled megawatt-hours	Cost
July	26,124	$47,545	February	20,990	$38,201
August	25,402	46,231	March	23,772	43,265
September	22,261	40,515	April	22,863	41,610
October	22,669	41,241	May	23,183	42,325
November	20,740	37,746	June	22,576	41,220
December	21,891	39,841			
January	22,121	40,260	Total	274,583	500,000

GENERAL STATEMENT

Mr. CANNON. Mr. Leavy, do you have a statement which you desire to make?

Mr. LEAVY. Mr. Chairman, I have a prepared statement.

Mr. CANNON. Suppose we put your statement in the record at this point.

Mr. LEAVY. Very well, sir.

(The statement referred to follows:)

STATEMENT OF CHARLES W. LEAVY, ADMINISTRATOR, SOUTHEASTERN POWER ADMINISTRATION

Mr. Chairman and gentlemen of the committee, Southeastern Power Administration is requesting supplemental funds in the amount of $500,000 for its appropriation for "Operation and maintenance" for fiscal year 1957, which amount would increase the appropriation requested from $1,378,000 to $1,878,000. The additional funds are requested solely for the purpose of making payments for wheeling performed under the recently executed contract of May 16, 1956, with the Georgia Power Co. This contract relates to the sale, wheeling, and firming of power from the Clark Hill project and provides means for the disposition of one-half the output of the project.

The requirements for payment of wheeling fees under the Georgia contract could not be anticipated at the time the estimate for fiscal year 1957 was made, and accordingly the regular appropriation request does not provide funds for this purpose. The contract with the Georgia Power Co. will permit wheeling of Clark Hill power to all preferred agencies in the company's service area and it is expected that power will be wheeled to between 75 and 80 preferred agencies. Service under the contract to two preferred agencies commenced on May 20, 1956. It is anticipated that seven more preferred agencies will begin to receive service under the contract on June 20, 1956, and that service to the balance of the preferred agencies will commence on July 20, 1956.

It is estimated that $500,000 will be required for the payment of wheeling fees during fiscal year 1957 on the basis of average water conditions. Since the loads of the preferred agency applicants for Clark Hill power in the Georgia Power Co. area far exceed the amount of power available from the project for wheeling to such agencies, it may be assumed that the entire amount of power available for this purpose will be wheeled under the contract and sold to preferred agencies. The Georgia Power contract will require funds only for the payment of wheeling fees, since firming energy will be sold by the company directly to preferred agencies.

The funds requested will be expended only as required for operation of the wheeling contract with the Georgia Power Co. No part of the funds requested will be used for payment of personal services.

Mr. CANNON. Mr. Leavy, do you have anything which you desire to say in supplement to your prepared statement?

Our time is very limited this afternoon.

Mr. LEAVY. No, sir. I think the statement tells the whole story of our request.

TUESDAY, JUNE 19, 1956.

BONNEVILLE POWER ADMINISTRATION

WITNESS

MORGAN D. DUBROW, MANAGER, WASHINGTON, D. C. OFFICE

OPERATION AND MAINTENANCE

Program and financing

	In budget, 1957	Revised, 1957 estimate	Difference, 1957 estimate
Program by activities:			
1. System operations and maintenance	$6,424,000	$6,619,000	$195,000
2. Power contracts and rates	268,000	268,000	
3. General administration	708,000	708,000	
Total obligations	7,400,000	7,595,000	195,000
Financing: Unobligated balance no longer available			
Appropriation	7,400,000	7,595,000	195,000

Obligations by objects

Object classification	In budget, 1957	Revised, 1957 estimate	Difference, 1957 estimate
Total number of permanent positions	975	975	
Full-time equivalent of all other positions	12	12	
Average number of all employees	947	947	
Number of employees at end of year	975	975	
01 Personal services:			
Permanent positions	$5,298,000	$5,442,000	$144,000
Positions other than permanent	54,500	57,000	2,500
Regular pay in excess of 52-week base			
Payment above basic rates	198,500	207,000	8,500
Excess of annual leave earned over leave taken [1]		21,000	21,000
Total personal services	5,551,000	5,727,000	176,000
02 Travel	209,700	209,700	
03 Transportation of things	32,500	32,500	
04 Communication services	187,800	187,800	
05 Rents and utility services	73,200	73,200	
06 Printing and reproduction	4,300	4,300	
07 Other contractual services	240,100	240,100	
Services performed by other accounts	696,700	715,700	19,000
08 Supplies and materials	389,400	389,400	
11 Grants, subsidies and contributions	5,300	5,300	
13 Refunds, awards, and indemnities	10,000	10,000	
Total obligations	7,400,000	7,595,000	195,000

[1] Amount required to cover increased requirement of annual leave reserve.

Mr. CANNON. The second item for consideration involves a request in the amount of $195,000 for maintenance and operation of the Bonneville Power Administration for a period of 12 months.

We have with us Mr. Morgan D. Dubrow, manager of the Washington office.

At this point in the record we will insert the pertinent section from House Document 420 and the justifications.

(The information follows:)

BONNEVILLE POWER ADMINISTRATION

"OPERATION AND MAINTENANCE

"For an additional amount for 'Operation and maintenance,' $195,000."

This proposed supplemental appropriation is necessary to provide for the cost of increases in wage rates of hourly employees of the Bonneville Power Administration which will become effective June 10, 1956. The new rates were established at the recent annual negotiating conference of the agency and the Columbia Power Trades Council.

OPERATION AND MAINTENANCE, BONNEVILLE POWER ADMINISTRATION

(H. Doc. 420)

Request for 12 months from July 1, 1956	$195,000
Appropriation to date	
Obligations to ———	
Expenditures to ———	
Budget estimate next fiscal year	
Employment:	
Average number, current appropriation	
Number involved this estimate	
Actual employment ———	

PURPOSE AND NEED FOR SUPPLEMENTAL FUNDS

To provide for added costs resulting from an increase in wage rates for hourly and craft type employees established through collective bargaining.

BONNEVILLE POWER ADMINISTRATION, OPERATION AND MAINTENANCE
1957 SUPPLEMENTAL ESTIMATE

System operations and maintenance, $195,000

One hundred and ninety-five thousand dollars is required in fiscal year 1957 to cover added costs resulting from an increase in wage rates of hourly employees of the Administration which will become effective June 10, 1956. The new rates were established by the 11th annual negotiating conference of the Administration and the Columbia Power Trades Council, completed May 10.

Since 1945 the Administration has established wage rates for hourly or craft type employees through collective bargaining. The policy followed is to adjust rates of pay to levels consistent with those adopted by the major electric utilities in the Administration's service area, both publicly and privately owned. The new rates of pay agreed upon at the current conference are consistent with rates established earlier this year for comparable work by four large privately owned electric utilities and three large publicly owned systems.

The amount of this supplemental budget request is determined by applying the increase in wage rates to the appropriate positions in the 1957 budget as presented to the Congress. This supplemental request will not change the number of positions from those in the budget.

It will not be possible to absorb the cost of the increased wages within the regular fiscal year 1957 appropriation request and adequately operate and maintain the Bonneville transmission system. System operating requirements as stated in the Administration's budget request are based directly upon essential substation staffing priced at the earlier wage rates for substation operators. Maintenance work requirements in the budget result from precise schedules

of work to be done priced at unit costs based upon former wage rates. Therefore, essential substation staffing and required maintenance cannot be accomplished without an increase in appropriations to compensate for the wage increase.

INCREASED WAGE RATES

Mr. CANNON. This request is to provide for increases in wage rates of hourly employees which have been established through collective bargaining. Do you have a statement, Mr. Dubrow?

Mr. DUBROW. I have a prepared statement, sir.

Mr. CANNON. Without objection, we will include the statement in the record at this point.

Mr. DUBROW. Very well, sir.

(The statement referred to follows:)

STATEMENT OF BONNEVILLE POWER ADMINISTRATION

Mr. Chairman and members of the committee, thank you for the privilege of discussing with you the supplemental operation and maintenance appropriation requirements of the Bonneville Power Administration for fiscal year 1957.

Under the Bonneville Act (sec. 10 (b)) the Administrator has the authority to establish rates of pay for ungraded or craft type employees. It has been the policy of the Administration to establish these rates through collective bargaining. The bargaining agent for ungraded employees, representing jointly the several different types of crafts, is called the Columbia Power Trades Council. The current negotiations were completed May 10.

The practice followed in the negotiations is to adjust rates of pay to levels consistent with those adopted by the major electrical utilities in the Administration's service area, both publicly and privately owned. Accordingly, a survey of major utilities is made each year prior to the negotiating conference to compare jobs and obtain wage data. The timing is such that the other utilities have concluded their negotiations by the time this survey is made. This year, the following utilities were surveyed:

Seattle City Light
Tacoma City Light
Puget Sound Power & Light Co.
Washington Water Power Co.
Pacific Power & Light Co.
Portland General Electric Co.
Chelan County Public Utility District

The survey revealed that the prevailing 1956 wage settlement for journeyman lineman, which is considered the key position in the electric utility industry, was a 5.5 percent increase. The following table shows the 1955 and 1956 rates for the lineman classification:

	1955	1956
Seattle City Light	$2.70	[1] $2.785
Tacoma City Light	2.70	[1] 2.825
Puget Sound Power and Light Co	2.70	2.85
Washington Water Power Co	2.70	2.85
Pacific Power and Light Co	2.70	2.85
Portland General Electric Co	2.70	2.85
Chelan County Public Utility District	2.70	2.85
Bonneville Power Administration	2.70	2.85

[1] The Seattle and Tacoma rates include increased fringe benefits.

Key positions in other crafts were considered accordingly and a 5.5 percent increase was applied to the great majority of classifications.

The amount of our supplemental budget request has been determined by applying the increase in wage rates to the appropriate positions in the fiscal year 1957 operation and maintenance budget as presented to the Congress, resulting in an increased requirement for wages of $195,000. This supplemental request will not change the number of positions from those in the budget.

It will not be possible to absorb the cost of the increased wages within the regular fiscal year 1957 appropriation request and adequately operate and main-

tain the Bonneville transmission system. System operating requirements for fiscal year 1957 were based directly upon essential substation staffing priced at the earlier wage rates for substation operators. Maintenance work requirements in the budget, also, were based upon precise schedules of work to be done priced at unit costs based upon former wage rates. Therefore, essential substation staffing and required maintenance cannot be accomplished without an increase in appropriations to compensate for the wage increase.

This supplemental request of $195,000 will increase the administration's total operation and maintenance estimate for fiscal year 1957 from $7,400,000, as shown in the regular budget, to $7,595,000.

Thank you.

Mr. PHILLIPS. May I ask a question on the Bonneville request?

Mr. CANNON. Yes.

Mr. PHILLIPS. Why can you not absorb $195,000 without coming back to us for additional money? How much will you have left over at the end of June 30, 1956?

Mr. DUBROW. This year?

Mr. PHILLIPS. Yes.

Mr. DUBROW. I think about $5,000 of operation and maintenance funds. The reason we cannot absorb it——

Mr. PHILLIPS. $5,000 is all you will have left over and you need to have more?

Mr. DUBROW. Yes, sir. However, the estimated $5,000 balance would not be available in fiscal year 1957 since the operation and maintenance appropriation is a 1-year fund and does not carry over.

Mr. PHILLIPS. How long is this $195,000 going to last? What period does that cover?

Mr. DUBROW. It covers the whole 1957 fiscal year starting July 1, 1956.

Mr. PHILLIPS. I thought this was a supplemental.

Mr. DUBROW. This is a supplemental for fiscal year 1957, Congressman Phillips. We have absorbed the part from May 10 to June 30 in fiscal year 1956.

Mr. PHILLIPS. That is all, Mr. Chairman.

Mr. TABER. What was your original estimate this year that resulted in an appropriation of $7.4 million?

Mr. DUBROW. That was the original estimate based on the wage rates which were in effect prior to the May 10, 1956, negotiated agreement, Mr. Taber.

Mr. TABER. That was the amount?

Mr. DUBROW. Yes, sir.

Mr. TABER. In other words, the committee gave you everything you asked for?

Mr. DUBROW. Yes, sir.

Mr. TABER. Frankly, it has only been a little while since we had the hearings on that, and it is kind of difficult to understand why you need more money this quick, and why you cannot go ahead and absorb it.

Mr. DUBROW. Well, Congressman Taber, we can absorb it only by deferring certain direct operation and maintenance work items which have been approved by the House and the Senate.

Mr. TABER. You have had this same condition to confront every year; have you not?

Mr. DUBROW. Yes, sir.

Mr. TABER. Is this the first time you have come in and asked for a supplemental to take care of it?

Mr. DUBROW. No, sir; I believe we have done so before.

Mr. TABER. For this particular thing?

Mr. DUBROW. Yes, sir.

Mr. TABER. When?

Mr. DUBROW. I would have to look at the record, but I am sure we have.

Mr. CANNON. You may supplement your testimony if you desire by including at this point an answer to that question.

(The supplemental answer is as follows:)

In fiscal year 1952, Bonneville Power Administration was faced with a similar necessity for supplemental funds to cover the cost of wage increases for hourly employees negotiated pursuant to the collective bargaining agreement. In the Third Supplemental Appropriation Act, 1952 (Public Law 375), there was provided an additional amount of $240,000 for "Operation and maintenance," of which $80,000 was for the purpose of covering the added costs of wage increases for hourly employees.

In ensuing years the total amounts of pay increases granted hourly employees were such that BPA found it possible to absorb the added costs within the appropriated funds available for "Operation and maintenance."

TUESDAY, JUNE 19, 1956.

BUREAU OF RECLAMATION

WITNESSES

E. G. NIELSEN, ASSISTANT COMMISSIONER

A. R. GOLZÉ, CHIEF, DIVISION OF PROGRAM COORDINATION AND FINANCE

N. B. BENNETT, CHIEF, DIVISION OF PROJECT DEVELOPMENT

F. E. DOMINY, CHIEF, DIVISION OF IRRIGATION

CONSTRUCTION AND REHABILITATION

Program and financing

	In budget, 1957	Revised estimate, 1957	Difference estimate, 1957
Program by activities:			
Construction of distribution systems		$12,700,000	$12,700,000
No change in other activities	$157,428,311	157,428,311	
Total obligations	157,428,311	170,128,311	12,700,000
Financing:			
Unobligated balance brought forward	−6,864,102	−6,864,102	
Unobligated balance carried forward	335,791	335,791	
Appropriation	150,900,000	163,600,000	12,700,000

Obligations by objects

Object classification	In budget, 1957	Revised estimate, 1957	Difference estimate, 1957
BUREAU OF RECLAMATION			
Total number of permanent positions	5,976	5,976	
Full-time equivlaent of all other positions	63	63	
Average number of all employees	5,300	5,300	
Number of employees at end of year	5,262	5,262	
01 Personal services:			
Permanent positions	$27,622,383	$27,622,383	
Positions other than permanent	220,526	220,526	
Payment above basic rates	388,607	388,607	
Total personal services	28,231,516	28,231,516	
02 Travel	742,196	742,196	
03 Transportation of things	862,806	862,806	
04 Communication services	405,046	405,046	
05 Rents and utility services	326,809	326,809	
06 Printing and reproduction	138,862	138,862	
07 Other contractual services	2,724,735	2,724,735	
Services performed by other agencies	566,517	566,517	
08 Supplies and materials	3,320,328	3,320,328	
09 Equipment	1,921,155	1,921,155	
10 Lands and structures	115,546,155	115,546,155	
11 Grants, subsidies, and contributions	30,000	12,730,000	$12,700,000
13 Refunds, awards, and indemnities	97,190	97,190	
15 Taxes and assessments	62,354	62,354	
Subtotal	154,975,669	167,675,669	12,700,000
Deduct charges for quarters and subsistence	247,358	247,358	
Total, Bureau of Reclamation	154,728,311	167,428,311	12,700,000
No change in allocation	2,700,000	2,700,000	
Total obligations	157,428,311	170,128,311	12,700,000

LOANS TO IRRIGATION DISTRICTS FOR CONSTRUCTION OF IRRIGATION DISTRIBUTION DISTRICTS

Mr. CANNON. The next item for consideration is the request of the Bureau of Reclamation with regard to making loans for the construction of irrigation distribution systems.

At this point in the record we will insert the pertinent section of House Document 403 and the justifications.

(The information follows:)

"BUREAU OF RECLAMATION

"CONSTRUCTION AND REHABILITATION

"For an additional amount for 'Construction and rehabilitation', $12,700,000, to remain available until expended."

This proposed supplemental appropriation is needed to permit the making of loans to irrigation districts for construction of irrigation distribution systems under the provisions of recently enacted legislation amending Public Law 130, 84th Congress, which provided basic authority for this purpose.

CONSTRUCTION AND REHABILITATION

CONSTRUCTION OF DISTRIBUTION SYSTEMS BY IRRIGATION DISTRICTS

Location

Various reclamation projects throughout the 17 Western States.

Authorization

Authorization for this program was provided by Public Law 130, 84th Congress, 1st session, as amended by Public Law No. 520 approved May 14, 1956. This amendment was passed to remove the objection raised by the President in his message of August 1, 1955.

Status

Several irrigation districts are in the process of preparing applications for loans under this program. Of these districts, Solano will be in a position to utilize funds in fiscal year 1957.

Summarized financial data

Allotment, fiscal year 1957	$12,700,000
Obligations, fiscal year 1957	12,700,000

Work proposed for fiscal year 1957

Solano Irrigation District ($12,700,000).—The Bureau of Reclamation cost estimate for the distribution system of the Solano project to furnish a full water supply to 71,881 acres is $12,700,000 and it is anticipated that the final cost estimates by the district will be approximately the same. This amount is needed in order for the Bureau to be in a position to grant the full amount of the loan as soon as the district can complete its plans and make formal application therefor.

The full amount of the loan should be available at the time the contract is signed, so that the district may proceed without the expense of delays and of uncertainties as to the availability of funds. Under this program while the full amount of the loan would be available for use as required, the Bureau would release funds to the district only as fast as a demonstrated need therefor could be shown, even though the actual expenditure of part of the funds might not be made until 1 or 2 years later.

Mr. CANNON. We have with us at this time Mr. E. G. Nielsen, Acting Commissioner of the Bureau of Reclamation.

Mr. Nielsen, will you please tell us something about this request for loan funds in the amount of $12,700,000 for a period of 12 months from July 1, 1956?

GENERAL STATEMENT

Mr. NIELSEN. Mr. Chairman, I have a prepared statement which I can insert, or I can read it, sir.

Mr. CANNON. We will include it in the record at this point.

(The statement referred to follows:)

GENERAL STATEMENT, BUREAU OF RECLAMATION

Under authority of Public Law 130 of the first session of this Congress as amended by the provisions of H. R. 8535 recently signed by the President, the Bureau of Reclamation is starting a new method of construction of distribution system on reclamation projects. This involves the construction of the system by those irrigation districts that wish to do so with funds provided through a loan from the Government.

Because it is new, there are many uncertainties as to what this program will amount to and how rapidly it will progress. There has been considerable interest in such loans and, in fact, the first request for a loan was made before the President signed the first bill. That district and several others are pushing ahead with their plans and hope to start construction before long. A few are encountering some problems and may find that it will take longer than they anticipate and some may even abandon their plans for loans. Although there may be some uncertainty as to which of the districts will be the first to complete its preliminary work, it is evident that one or more will be ready before the end of fiscal year 1957. Funds should be available so that the work may proceed without the expense of delays. Delays will mean expense for most of such districts because they do not have a sufficient volume of work to permit shifting to other jobs while they wait.

The Bureau of Reclamation is requesting $12,700,000 to permit work under this authority. This amount conforms with the estimate of the construction costs of the system for the Solano Irrigation District in California, which is the largest system among those that have indicated interest in a loan. This District was the first to request a loan and has been diligently working on its plans ever since. We believe it will be the first to complete the necessary preliminary work. Although this district has indicated the desire to start con-

struction in July, we feel that it will be later in the fiscal year before it is actually ready. At present it appears that the other districts might not complete their work much before the end of the fiscal year.

It appears to be impractical to grant a loan unless the full amount is available at the time even though the work may continue into two or more fiscal years. This is, of course, the general practice in such loans and avoids the uncertainties and expense that are attendant upon annual appropriations. However, the Bureau plans to release the funds to the district only as required, not as a lump-sum at the time of the loan contract.

LOAN PROGRAM AUTHORIZED BY PUBLIC LAW 130

Mr. CANNON. Is this the first request for funds for loans to irrigation districts for the construction of distribution systems on reclamation projects as authorized by Public law 130?

Mr. NIELSEN. This is the first ,sir.

Mr. CANNON. Will you give us in some detail the program under which such loans would be made? How would you go about securing a loan and how would you go about making a loan?

Mr. NIELSEN. The requests for loans will come, of course, from the irrigation districts for distribution systems under projects authorized to the Bureau of Reclamation. They are reclamation authorized projects and the loan would be for the purpose of enabling the district itself to construct the distribution system.

Mr. CANNON. And for no other purpose?

Mr. NIELSEN. For no other purpose; that is right, sir. We would expect the district applying for the loan to tell the Secretary just what it is they propose to build and give a reasonable report as to the standards of construction that they would employ and, of course, ultimately we would enter into a contract for repayment of the loan.

I would like to add something as to the matter of repayment of the loan, sir.

Mr. CANNON. Well, let me ask you about that. Suppose you had an instance where the cost allocable to irrigation would be beyond the repayment capacity of the irrigation district's water users; how would you handle that, or would it be paid from power or other revenues?

Mr. NIELSEN. Not under Public Law 130 as we see it.

Mr. CANNON. It could not, then, be paid from power or other revenues?

Mr. NIELSEN. Not as we see it today, and as we have gone into it thus far.

Mr. CANNON. Will the irrigation districts be expected to assume the responsibility for operations and maintenance?

Mr. NIELSEN. Yes, sir.

Mr. CANNON. Just as soon as construction is completed?

Mr. NIELSEN. That would follow, as I see it, from the date of completion of construction.

Mr. CANNON. Is it anticipated that there would be any savings to the irrigation district in handling its own construction, in lieu of construction by the Department of the Interior?

Mr. NIELSEN. They think that there would be. That is the basis upon which they sponsored the loan.

Mr. CANNON. They have that option?

Mr. NIELSEN. Yes, sir.

SOLANO IRRIGATION DISTRICT

Mr. CANNON. How was the estimate of $12.7 million for the loan to the Solano project determined?

Mr. NIELSEN. Mr. Chairman, we are in the early stages of negotiations with regard to that loan.

Mr. CANNON. It has not yet been concluded?

Mr. NIELSEN. No, sir; but it is our estimate of the cost of an adequate distribution system.

Mr. CANNON. And that is the Federal estimate?

Mr. NIELSEN. Yes, sir; we would expect them to anticipate a lesser cost than under our construction, but we do not have their estimate today.

Mr. CANNON. Both of the regular 1957 House and Senate bills contained the budget estimate of $12.2 million for the Solano project, and this includes $300,000 for preconstruction activities on the distribution system. Will this $300,000 be required if the loan is approved, or would approval of the loan obviate the necessity for including the $300,000?

Mr. NIELSEN. We will have to check into that.

Mr. CANNON. You may include a statement with regard to that question when your remarks come to you for correction.

(The statement requested follows:)

The estimated cost of $12,700,000 for the Solano distribution system covers Government costs as well as funds required by the district for construction of the system. Therefore, the $300,000 programed in 1957 for the distribution system of the Solano project is not required if the full amount of the loan is approved.

Mr. CANNON. What is the status of the application by the Solano District for this loan?

Mr. NIELSEN. They have made application but we have not satisfied ourselves that their application is complete in all respects.

Mr. CANNON. Is there a possibility that it will not be made?

Mr. NIELSON. No, sir; I think it is a matter of negotiating the loan and the terms of the loan.

Mr. CANNON. It is a matter of securing the proper terms?

Mr. NIELSEN. Yes, sir; that is right.

Mr. CANNON. When would the distribution system be completed if construction is started in fiscal year 1957?

Mr. NIELSEN. Our schedule would take 3 years. If the Bureau were building it, we would expect to spend 3 years on construction of the distribution system.

Mr. CANNON. And it would be completed in 1960?

Mr. NIELSEN. Yes. sir.

ESTIMATED LOAN ADVANCE FOR FISCAL YEAR 1957

Mr. CANNON. What is the estimate of the amount of the loan that would be advanced to the district during fiscal year 1957?

Mr. NIELSEN. We would have to wait until we got their program as to their rate of construction before we could answer that.

Mr. CANNON. What would you say it might be?

Mr. NIELSEN. I would estimate that in the first year it would be $1.5 million.

Mr. CANNON. Then, if that is true, you would not need the whole amount right now; would you?

Mr. NIELSEN. That is the point I wanted to talk about.

Mr. CANNON. Yes. We would be glad to have some light on that question.

Mr. NIELSEN. Our attorneys doubt that we could enter into a loan contract unless that loan contract is backed up by the whole of the amount of the loan in appropriated funds available to us. In other words, we would not enter into some sort of a loan contract contingent upon an appropriation proviso in that contract.

Mr. CANNON. You have to be assured of the full amount of the loan before you proceed?

Mr. NIELSEN. We think so, and we think we must have the whole of the amount available to obligate under this contract.

Mr. CANNON. Then under those circumstances it would either be $12.7 million or nothing?

Mr. NIELSEN. That is what we think; yes, sir.

OTHER LOAN PROPOSALS PENDING

Mr. CANNON. On what other projects do you expect to make loans in fiscal year 1957?

Mr. NIELSEN. We have several proposals including one from Terra Bella Irrigation District in California, and another from the Madera Irrigation District in California, and there are more in various stages of questioning us, and approaching us.

Mr. CANNON. With reference to these other loans which you expect to make during 1957, would you say they would be comparable in amount to this loan which we have before us at this time?

Mr. NIELSEN. First, we do not expect to make any loan other than the Solano loan in this year, because it will take the whole of the $12.7 million, as we anticipate it.

Mr. CANNON. However, you will enter into negotiations on other projects?

Mr. NIELSEN. Yes, sir.

Mr. CANNON. And, necessarily, they will have to be completed in 1958?

Mr. NIELSEN. Yes, sir.

APPROPRIATION LANGUAGE

Mr. CANNON. Could the Department propose language to us for the appropriation bill which would make it clear that you would not need the entire amount to enter into a loan contract?

Mr. NIELSEN. We can explore that with our attorneys and see if they could furnish that type of language.

Mr. CANNON. Suppose you take that up with your attorneys and then tell us at the earliest possible date their conclusion along that line.

Mr. NIELSEN. We shall be glad to do that.

(The information requested follows:)

Provided, That any contract under the Act of July 4, 1955 (69 Stat. 244), as amended, which calls for the making of loans beyond the fiscal year in which the contract is entered into shall be made only on the same conditions as those prescribed in section 12 of the Act of August 4, 1939 (53 Stat. 1187, 1197).

Section 12 referred to in the proviso is as follows:

"When appropriations have been made for the commencement or continuation of construction or operation and maintenance of any project, the Secretary may, in connection with such construction or operation and maintenance, enter into contracts for miscellaneous services, for materials and supplies, as well as for construction, which may cover such periods of time as the Secretary may consider necessary but in which the liability of the United States shall be contingent upon appropriations being made therefor."

Under the proviso, therefore a loan contract could be made only after an appropriation of funds toward construction of the distribution system, and as to any amount of the loan in excess of funds so provided, it would have to be expressly contingent upon appropriations. To the extent that the availability of less than the full amount of the loan in any fiscal year should delay the irrigation district in making contracts for materials, construction, etc., or should require soliciting bids for a contract subject to future availability of funds, the costs to the irrigation district might be increased, although this has not been a problem for the Bureau of Reclamation in carrying out its direct construction program. Whether an appropriation of less than the amount of the loan (estimated cost of a completed system) would deter an irrigation district from committing itself to expenditures which are within the appropriated amounts of the loan but will not complete the system, we do not presently know.

Mr. RABAUT. I was wondering if there would be any flexibility for the use of the funds provided in the regular 1957 appropriation?

Mr. NIELSEN. If we had more money available to us, presumably we might finish Terra Bella and Madera faster. Does that respond to your question?

Mr. RABAUT. It is more or less in your hands. It seems like a lot of money just to stand idle.

Mr. NIELSEN. That is right. Of course, we will not advance that money, under our thinking at least, except as the irrigation district needs it. We do not intend to turn the whole of the $12.7 million over to the district.

Mr. RABAUT. You will take it up, anyway, with your attorneys, and see if you can do something, or arrive at something in reply to the proposal which was made by the chairman?

Mr. NIELSEN. Yes, sir.

DEPARTMENTAL ESTIMATE

Mr. BOLAND. How much did you ask of the Bureau of the Budget for this particular program?

Mr. NIELSEN. About $22,560,000.

Mr. BOLAND. And the reason why the Bureau of the Budget cut it back was because you had no firm commitments with the districts, or that the applications had not been formalized?

Mr. NIELSEN. I rather think they felt the applications had not been carried far enough.

Mr. BOLAND. Do you know of any applications that have been carried along? Are there any applications that have been carried such as the Solano project that could use money now?

TERRA BELLA AND MADERA

Mr. NIELSEN. Terra Bella and Madera are not too far along.

PORTERVILLE

Mr. BOLAND. What is the story on Porterville? Have you had an application from Porterville?

Mr. NIELSEN. Yes, sir; we have had an exchange of correspondence with Porterville.

Mr. BOLAND. You think that under the interpretation or at least as a result of the conference that you had with your lawyers that you have to have the $12.7 million even though you are not going to use it?

Mr. NIELSEN. Yes, sir.

INTEREST-FREE LOANS

Mr. PHILLIPS. What interest does the irrigation district pay on this money?

Mr. NIELSEN. This is without interest.

Mr. PHILLIPS. Without interest for the entire time?

Mr. NIELSEN. Yes, sir.

Mr. JENSEN. In the law that set up this small loan operation to irrigation projects, was there any provision in that law which provided that the irrigators or irrigation district were required to attempt to get local money before they could get a loan?

Mr. NIELSEN. The law provides that they must provide not to exceed 10 percent in the way of rights-of-ways, cash, materials, equipment, and so on.

Mr. JENSEN. The law provides that the district must provide that?

Mr. NIELSEN. They must put up not to exceed 10 percent in terms of rights-of-way, cash money, materials, equipment and so forth.

Mr. JENSEN. But there is no requirement that they must attempt to get money from some other source?

Mr. NIELSEN. They are not required to make a showing that they do not have other credit resources.

Mr. JENSEN. They are not required to do that?

Mr. NIELSEN. No, sir.

Mr. JENSEN. Well, we are treating them, of course, a little better than we are treating small business loans from the Small Business Administration. They require under that law that the applicants must exhaust all efforts to get local money or private money from other sources before they come to the Government.

Mr. NIELSEN. Yes, sir.

Mr. JENSEN. Now, that is not required in any manner here?

Mr. NIELSEN. No, sir. This law merely substitutes the irrigation district for the Bureau of Reclamation.

Mr. JENSEN. I do not quite understand why your Solicitor has ruled that you must have all the money before you can enter into a contract. We have started projects and have done so for many, many years and we appropriate money which is not a fraction of the amount that is going to be needed to complete the job, but they enter into contracts anyway for generators and so forth, no end.

Mr. NIELSEN. That is right. This is a loan contract. Our general procedure, of course, is for construction by the Bureau of Reclamation. This is a loan contract. The district borrowing the money——

Mr. JENSEN. I can see it is another category.

Mr. NIELSEN. Could be in trouble.

Mr. JENSEN. I can understand that.

Mr. NIELSEN. It is a long-range contract.

Mr. JENSEN. But, of course, the facts are that the Congress would not enter into an agreement with any person or persons knowing full well it was going to take $12.7 million to complete the job and then only appropriate, say, $2 million or $3 million to start with.

Mr. NIELSEN. Yes, sir.

Mr. JENSEN. That is, and not complete the payment and complete our obligation. The Congress has never done that, but I understand this situation. This is in a different category.

Mr. NIELSEN. The district would find it hard to pass that "contingent upon appropriation" language onto its contractor.

Mr. JENSEN. As far as I am concerned, I am going to tell you frankly that I think we should, as you say, either appropriate the full amount or make none at all available. I think we should appropriate the full amount or none at all in this case.

Mr. TABER. Mr. Nielsen, I believe you are asking for $12.7 million; are you not?

Mr. NIELSEN. Yes, sir.

Mr. TABER. Where is the Solano project located?

Mr. NIELSEN. That is located in California, in northern California, sir.

Mr. TABER. You will loan that money to them to build a distribution system?

Mr. NIELSEN. Yes, sir.

Mr. TABER. Would they pay any interest on it?

Mr. NIELSEN. They do not pay any interest; no, sir.

Mr. TABER. Why should they not pay interest?

Mr. NIELSEN. The law does not provide for that, sir.

Mr. TABER. You mean there is a law that says you can loan money for that purpose without interest?

Mr. NIELSEN. Yes, sir. That is Public Law 130.

Mr. TABER. That is a new bill; is it not?

Mr. NIELSEN. That is a new bill that is newly amended and put into effect.

Mr. TABER. Do they pay anything out of the power toward the cost of it?

Mr. NIELSEN. No, sir. The law says they shall provide not to exceed 10 percent of the loan, and that 10 percent may be in terms of rights-of-way, materials, labor, cash, and so forth.

Mr. TABER. Has this ever been done before?

Mr. NIELSEN. No, sir.

Mr. TABER. In other words, it is a new wrinkle?

Mr. NIELSEN. It is, under this law. Of course, private irrigation districts have built many, many distribution systems.

Mr. TABER. Yes; but the Government did not loan them the money.

Mr. NIELSEN. Not through the Bureau of Reclamation, at least. The Public Works Administration did in the past, I believe.

Mr. TABER. The Public Works Administration did it in the past?

Mr. NIELSEN. I think so; yes, sir.

Mr. TABER. When was that? Was that back in the thirties?

Mr. NIELSEN. Yes, sir.

Mr. JENSEN. That was under the old PWA.

Mr. CANNON. Are there any further questions, gentlemen? If not I should like to ask Mr. Nielsen a question or two with respect to the funds from which these loans will be made.

USE OF AVAILABLE CONSTRUCTION FUNDS FOR LOANS AUTHORIZED

Mr. CANNON. Does the basic act provide for the use of new or already appropriated construction funds for making loans, and if so do you propose to use construction funds for this purpose?

Mr. NIELSEN. The act authorizes the Secretary to make funds available on a loan basis from moneys appropriated for the construction of distribution systems to any irrigation district or other public agency in an amount equal to the estimated construction cost of such system. This language is quite specific as to the Bureau's authority to make loans to the districts for building distribution systems from new or already appropriated construction funds. However, it is the established practice of the Bureau only to transfer construction and rehabilitation funds among projects for maximum accomplishment of programs approved by the Congress. Funds so transferred are those which become available through savings or deferred work or other means. If during a fiscal year the Bureau contracts to make a loan for the construction of a distribution system, it would not transfer excess funds from other projects unless the distribution system work is in a program approved by the Congress. Committee's advance approval of transfers would be required in all cases where it represents a new feature start during the year.

I should like to point out to the committee what appears to us in the Bureau to be a definite handicap in the use of either funds appropriated for 1 year's work or transferred from other projects. In the normal course of events funds are appropriated to the Bureau to cover only 1 year's work, and when money remains unobligated at the end of a fiscal year, such funds are taken into consideration by the Congress in determining appropriations for the succeeding year. This means, therefore, that funds for additional allotments, such as for these distribution systems, are rather limited, especially until perhaps the end of the fiscal year. And, as has been pointed out, we consider it essential that when a loan is made to an irrigation district for construction of one of these distribution systems the full amount of the estimated cost of such system should be available. This course would preclude many of the problems and the additional expense incident to the uncertainty of annual appropriations. The district should be assured of funds to complete its work. In answer to the second part of your question, we do not propose to use available construction funds for this purpose unless so directed by the Congress.

LOANS TO BE PROGRAMED IN BUDGET

Mr. CANNON. Will such loans be programed in the budget each year?

Mr. NIELSEN. Yes, sir. It is contemplated that they will. There is considerable interest being shown in this program by the various districts. As plans for these distribution systems are completed and approved by the Secretary, the total estimated cost of such distribution systems will be programed and included in the budget estimate.

Mr. CANNON. If there are no further questions, the committee stands adjourned.

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